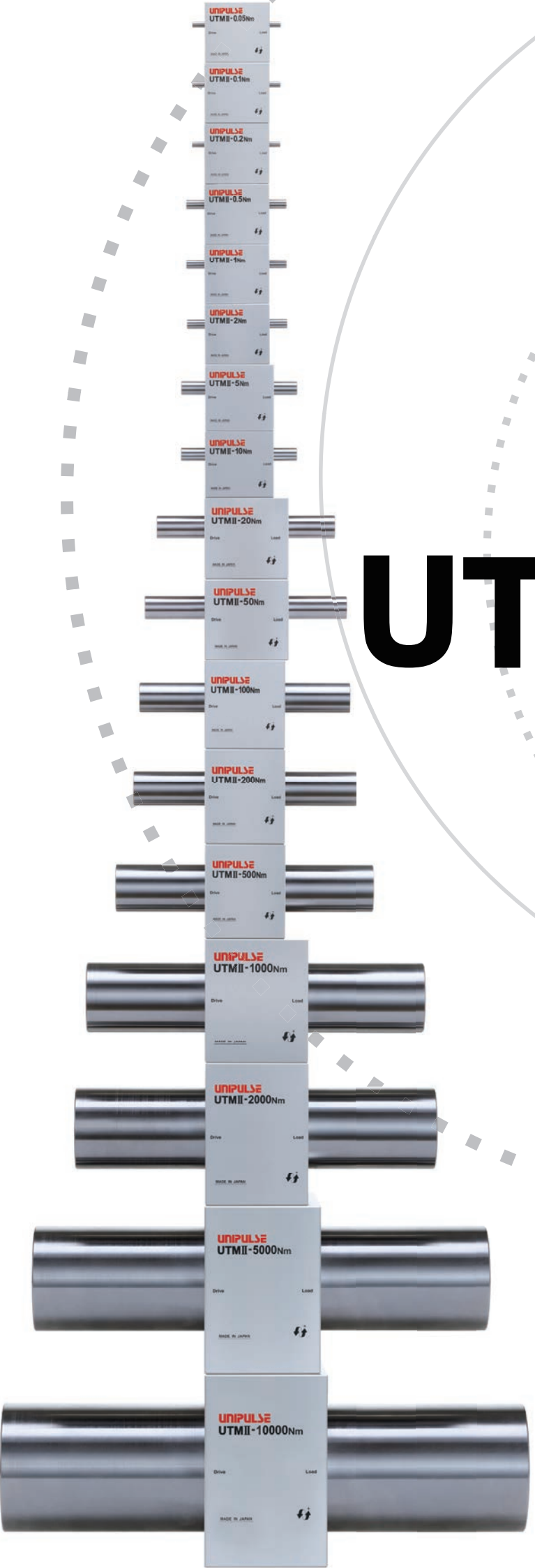
UNIPULSE



UTMII series

Rotating Torque Meter

CE RoHS

TOKYO VENTURE TECHNOLOGY AWARD

A SLIP-RING-LESS TORQUE METER —— CRAMMED OUTSTANDING SPECS INTO A TINY BODY

A longtime dream, a slip-ring-less rotating torque meter, UTMⅡ, has just become available. We developed it as a high performance sensor for embedded applications. Of course, it is also perfect for general dynamic torque measurement. This is our masterpiece, which has 1/10000-resolution, outstanding zero-point stability and 1kHz-bandwidth (sampling frequency of 6kHz).

UNIPULSE was established by several young engineers in 1970 and has specialized in industrial measurement since that time. We have developed a lot of unique products and expanded our own market. Though we had wished to make a high-performance torque meter for 40 years, we couldn't do so because miniaturization of electronics was not possible. However, we have finally succeeded in developing a rotating torque meter, UTMⅡ, by adopting small advanced electronic components and integrating our own technologies related to precision machining, strain gauge technology and electronics.

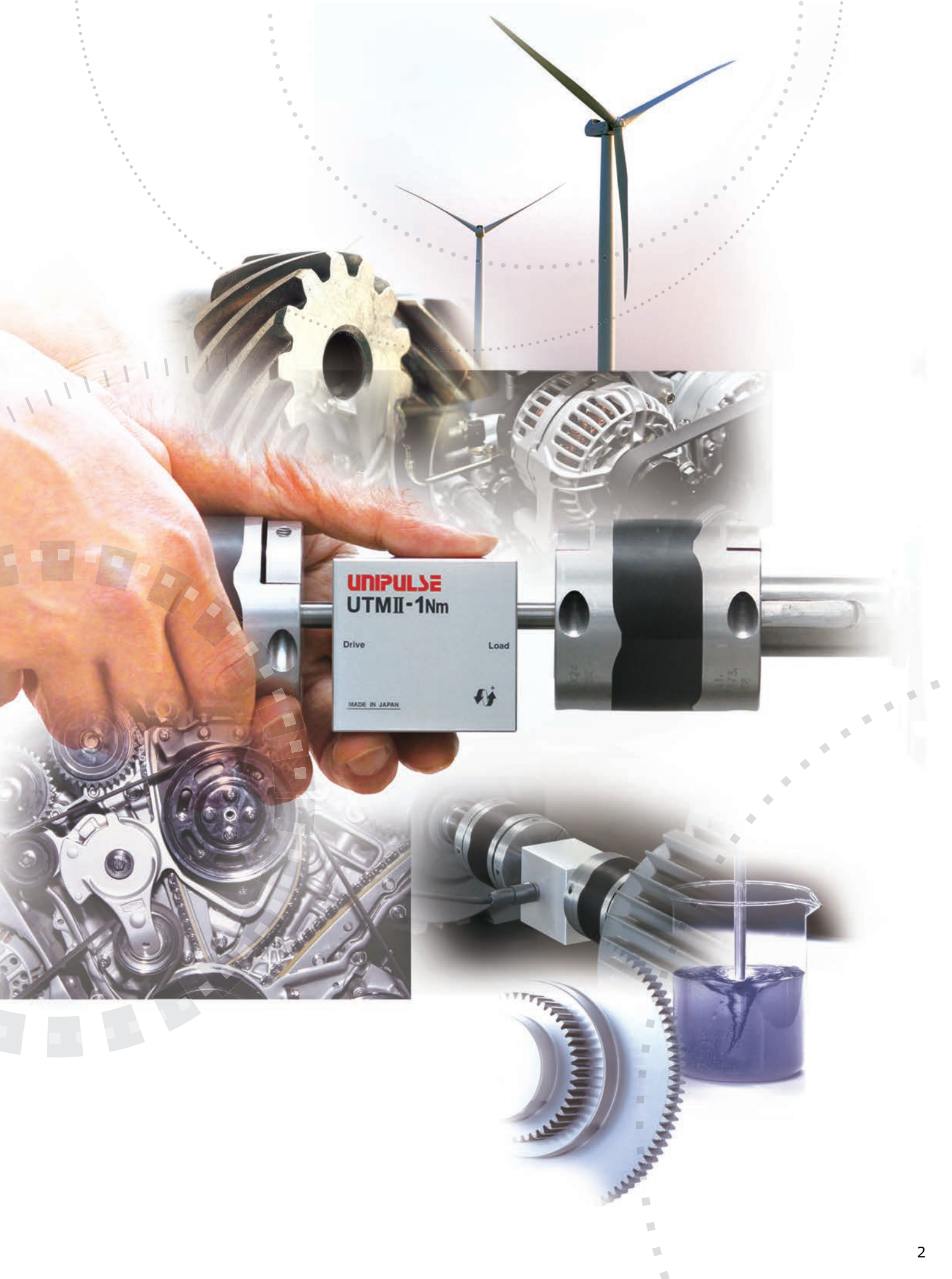
UTMⅡ has a range of 17 models (0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, 10000Nm).

UTMⅡ withstands overload of 500% and, with its internal circuits all insulated, operates stably even in a high noise environment. The models ranging from 0.05 to 10Nm guarantee operation at the max. speed of 25000rpm.

All the models of UTMⅡ output a 4-pulse rotation detection signal per rotation. An optical encoder can optionally be built in models ranging from 0.05 to 50Nm. This encoder is used mainly for measuring torque variation (such as a physical sensory test) with angular position. Key grooves are optionally available for models ranging from 5 to 10000Nm. Square drive option is now available in 100Nm and 500Nm capacity for use with nut runners. Moreover, UTMV series, a rotating torque sensor with degree of protection equivalent to IP65 , is now available to meet users' needs for use in harsh environment. UTMV series is available in 10 capacity range: 0.1, 0.5, 1, 5, 10, 50, 100, 500, 1000, and 5000Nm capacity. For measurement signal voltage, full-scale values of normal/ reverse rotations are calibrated to ± 5.0000V before shipping.

We hope you are looking forward to our future products.

President & CEO
Takami Yoshimoto
(From an engineer's view point. . .)


UNIPULSE
UTMⅡ-1Nm
Drive
Load
MADE IN JAPAN

Features of UTMⅡ

- High response speed with cut-off frequency of 1kHz (sampling frequency of 6kHz).
  This series can be used for not only fast process monitoring but also torque feedback control.
- Safe overload of 500%.
- 1, 2 and 5-line capacities are standardized from 0.05Nm to 10000Nm.
- A rotational pulse generating circuit (4 pulses/revolution) is built in as standard.
  Lower rotational speed can be measured accurately.
- Improved noise immunity with insulated powering and signaling system.
- 1/10000 resolution.
- Outstanding zero-point stability.
- Max. rotational speed: 25,000 rpm (up to 10Nm).
- Low frictional rotating torque.
- Smart system configuration with no external circuits needed.
  Voltage signal ± 5V no external amplifier necessary.
- CE marking certification, RoHS-compliant product

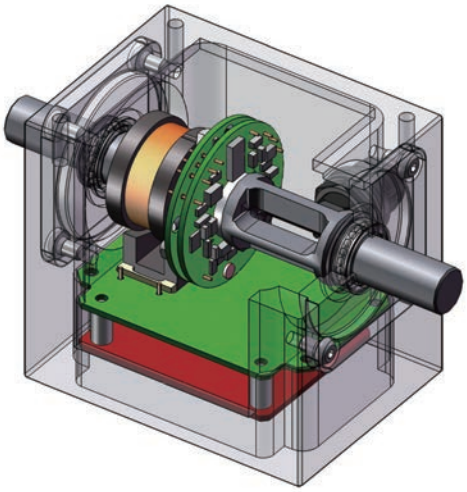
Line-up

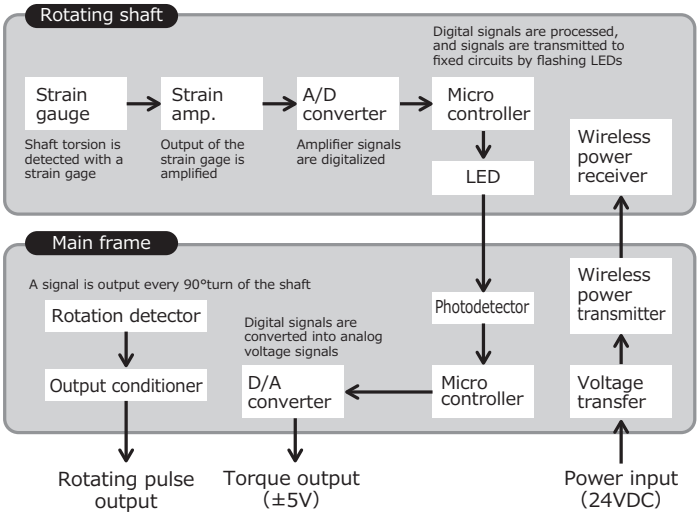
Range Nm		0.05	0.1	0.2	0.5	1	2	5	10	20	50	100	200	500	1000	2000	5000	10000
Max. speed rpm		25000								20000		15000	12000	10000	7000	6000	5000	4000
Main frame dimension W × H × D mm		54 × 50 × 40						57 × 55 × 40		70 × 68 × 51		67 × 74 × 57	67 × 79 × 62	67 × 79 × 72	86 × 103 × 98	86 × 119 × 111	97 × 141 × 137	103 × 166 × 162
Length mm		74			84			97		150	170	177	187	217	286	306	387	447
Shaft dia. mm		ϕ 5			ϕ 8			ϕ 12		ϕ 20		ϕ 25	ϕ 30	ϕ 40	ϕ 60	ϕ 70	ϕ 90	ϕ 110
Approx. weight g		160			180			270		700		1100	1500	2600	7300	10500	21400	36000
Option	Rotary encoder	○	○	○	○	○	○	○	○	○	○							
	Key groove							○	○	○	○	○	○	○	○	○	○	○
	Square drive											○		○				
UTMV drip-proof type			○		○	○		○	○		○	○		○	○		○	

Overview

Principle of UTMⅡ

UTMⅡ adopts strain gauges for detecting torsional strain, which is converted into an electric signal by a strain amplifier fixed on the rotating shaft. Electric power for the rotary electronics is supplied continuously through a wireless power system originally developed by UNIPULSE. The detected torque signal is converted into a digital signal, and it is transmitted to the main-frame electronics via a light signal. The rotating shaft is suspended with only two small bearings, resulting in very low rotational friction.





Compact and easy to install

The six models (0.05, 0.1, 0.2, 0.5, 1, 2Nm) are compact and light: 54W × 50H × 40Dmm in size, 200g or less in weight.

High accuracy and stability

1/10000 resolution with outstanding zero stability. Even small torque variations can be detected by UTMⅡ.

Small starting torque

The starting torque of the bearing in the UTMⅡ -0.05Nm is only 0.00001Nm (0.03 %FS). Actually, the effect of rotating friction can be negligible.

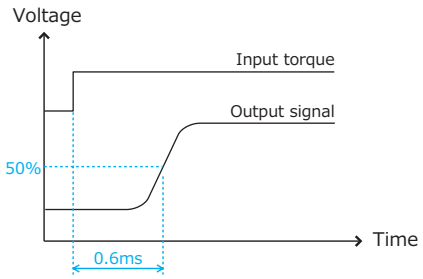
Maintenance-free

No slip-ring.
The lifetime of UTMⅡ is mainly determined by the lifetime of bearings.

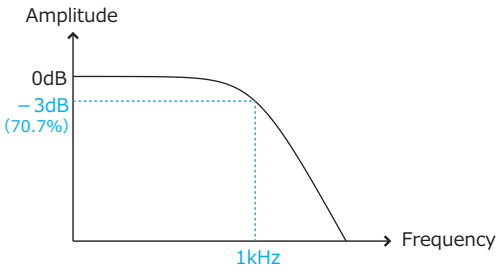
Response characteristics

With the high-speed A/D conversion at the rate of 6kS/s, we've achieved a very short delay time of 0.6ms and cut-off frequency of 1kHz.

■ Delay time 0.6ms



■ Sine wave frequency response



Indicators for UTMⅡ

Easy connection to UTMⅡ just by using a snap-on cable.

■TM301:basic type
Torque, rotation speed, and power are displayed simultaneously.

■TM400:portable type
Torque vs. rotation speed / torque-angle waveform can be monitored.

■TM700:graphic monitor with high sampling speed
Display the waveforms of torque, rotation speed, and power.

■TM500:angle monitor
Waveform display of torque variation against angles

■TM201:for R&D and laboratory use
Monitor and save torque, rotation speed, and power on PC

UTMⅡ-0.05/0.1/0.2Nm

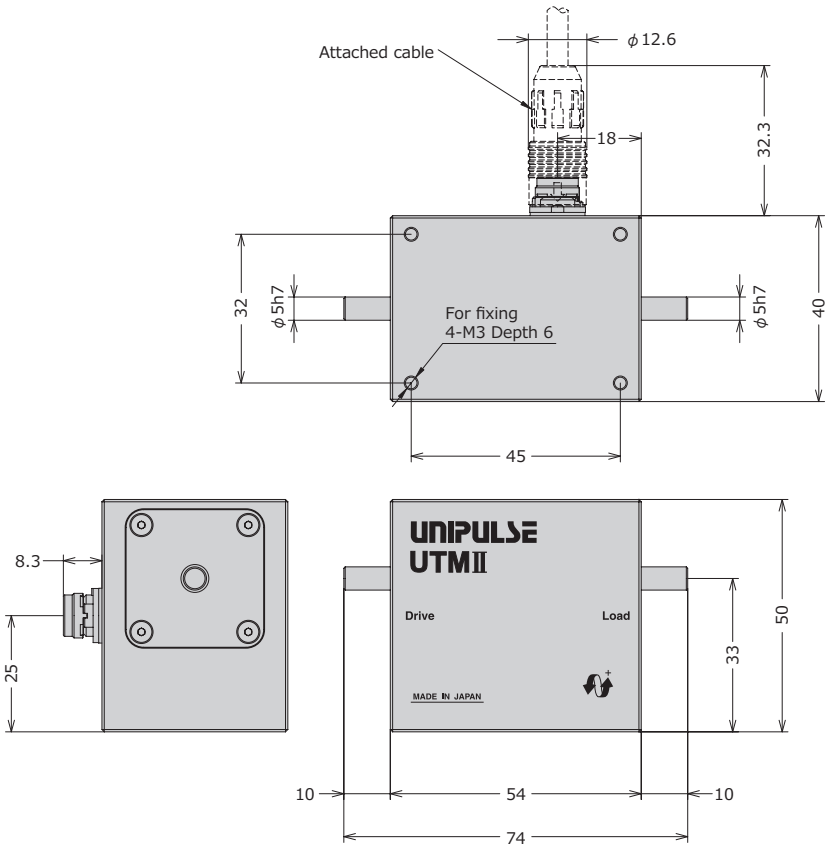
Rotary encoder

■ Specification

Type	UTMⅡ-0.05Nm	UTMⅡ-0.1Nm	UTMⅡ-0.2Nm
Measurement range	± 0.05Nm	± 0.1Nm	± 0.2Nm
Power supply	DC24V ± 15% Consumption current : 100mA or less		
Output range	± 5V DC Load resistance must be more than 2kΩ		
Responsivity	1kHz		
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30V, 10mA		
Safe overload	500% FS		
Non-linearity	0.03% FS (Typ)		
Hysteresis	0.03% FS (Typ)		
Repeatability	0.03% FS (Typ)		
Operation temp. range	-10 to +50℃		
Temp. effect on zero	0.01%FS/℃ (Typ)		
Temp. effect on span	0.01%FS/℃ (Typ)		
Max. rotation speed	25000rpm		

Type	UTMⅡ-0.05Nm	UTMⅡ-0.1Nm	UTMⅡ-0.2Nm
Torsional spring constant	5.67Nm/rad	11.57Nm/rad	26.10Nm/rad
Maximum torsional angle	8.81×10^{-3}rad (0.505°)	8.64×10^{-3}rad (0.495°)	7.66×10^{-3}rad (0.439°)
Inertia moment	8.77×10^{-7} kgm^2	8.87×10^{-7} kgm^2	8.99×10^{-7} kgm^2
Dimension (Main frame)	54 (W) × 50 (H) × 40 (D) mm		
Weight	Approx. 160g		
Attached cable	6 wires (End points: Peeled insulator and soldered)		
Accesories	CATM51 : 5m CATM12 : 10m		
CE marking certification	EMC directives : EN61326-2-3 : 2013		

Dimension



Supported couplings
UCM15
UCS15
UCM19
UCS19
UCM25
UCS25

Refer to page 26 for details of couplings

Unit : mm

UTMⅡ-0.5/1/2Nm

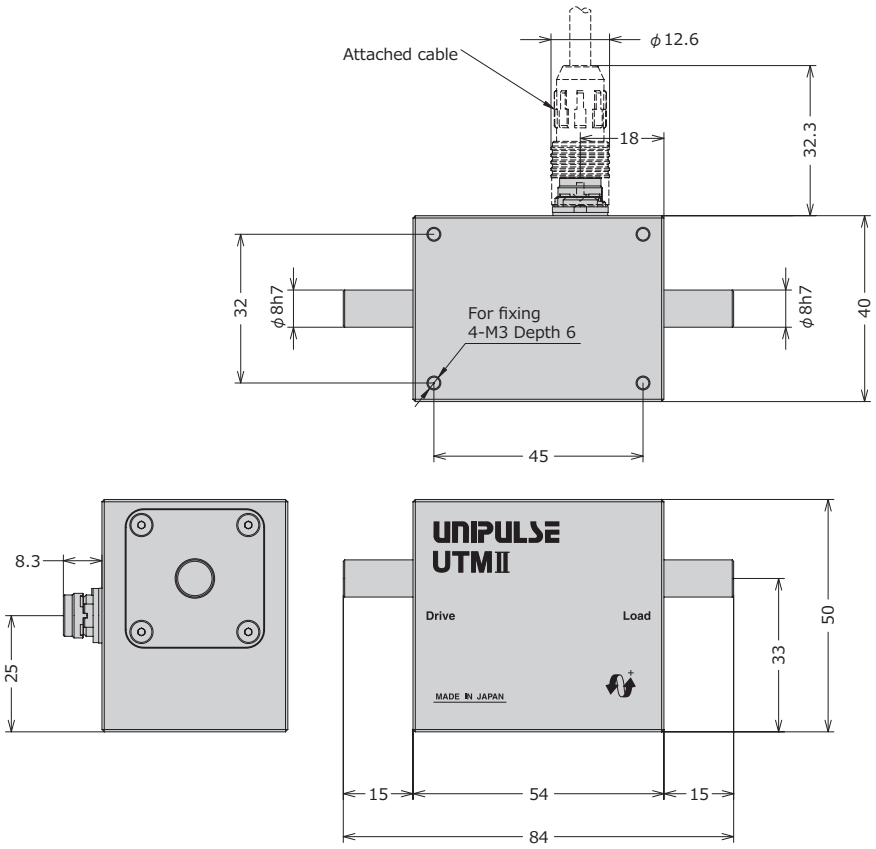
Rotary encoder

■ Specification

Type	UTMⅡ-0.5Nm	UTMⅡ-1Nm	UTMⅡ-2Nm
Measurement range	± 0.5Nm	± 1Nm	± 2Nm
Power supply	DC24V ± 15% Consumption current : 100mA or less		
Output range	± 5V DC Load resistance must be more than 2kΩ		
Responsivity	1kHz		
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30V, 10mA		
Safe overload	500% FS		
Non-linearity	0.03% FS (Typ)		
Hysteresis	0.03% FS (Typ)		
Repeatability	0.03% FS (Typ)		
Operation temp. range	-10 to +50℃		
Temp. effect on zero	0.01%FS/℃ (Typ)		
Temp. effect on span	0.01%FS/℃ (Typ)		
Max. rotation speed	25000rpm		

Type	UTMⅡ-0.5Nm	UTMⅡ-1Nm	UTMⅡ-2Nm
Torsional spring constant	93.1Nm/rad	188Nm/rad	414Nm/rad
Maximum torsional angle	5.37×10^{-3}rad (0.308°)	5.32×10^{-3}rad (0.305°)	4.83×10^{-3}rad (0.277°)
Inertia moment	1.49×10^{-6} kgm^2	1.52×10^{-6} kgm^2	1.42×10^{-6} kgm^2
Dimension (Main frame)	54 (W) × 50 (H) × 40 (D) mm		
Weight	Approx. 180g		
Attached cable	6 wires (End points: Peeled insulator and soldered)		
Accesories	CATM51 : 5m CATM12 : 10m		
CE marking certification	EMC directives : EN61326-2-3 : 2013		

Dimension



Supported couplings
UCM19
UCM25
UCS25
UCM30
UCS30
UCM34
UCS34
UCM39
UCS39
UCM44

Refer to page 26 for details of couplings

Unit : mm

UTMⅡ-5/10Nm

Rotary encoder | Key groove

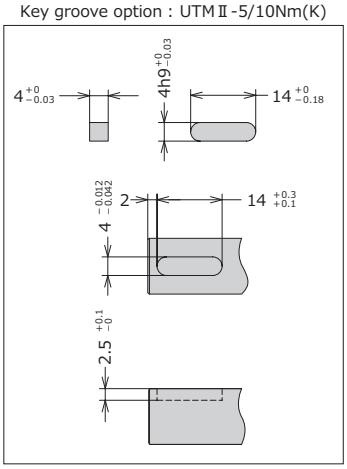
■ Specification

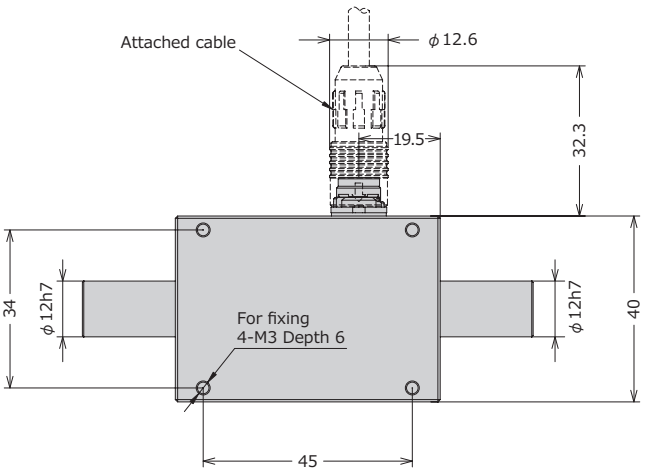
Type	UTMⅡ-5Nm	UTMⅡ-10Nm
Measurement range	± 5Nm	± 10Nm
Power supply	DC24V ± 15% Consumption current : 100mA or less	
Output range	± 5V DC Load resistance must be more than 2kΩ	
Responsivity	1kHz	
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30V, 10mA	
Safe overload	500% FS	
Non-linearity	0.03% FS (Typ)	
Hysteresis	0.03% FS (Typ)	
Repeatability	0.03% FS (Typ)	
Operation temp. range	-10 to +50℃	
Temp. effect on zero	0.01%FS/℃ (Typ)	
Temp. effect on span	0.01%FS/℃ (Typ)	
Max. rotation speed	25000rpm	

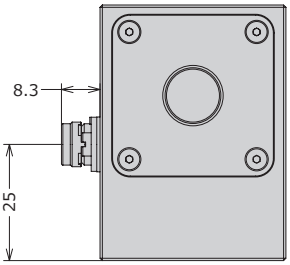
Type	UTMⅡ-5Nm	UTMⅡ-10Nm
Torsional spring constant	691Nm/rad	1851Nm/rad
Maximum torsional angle	7.24×10^{-3}rad (0.415°)	5.40×10^{-3}rad (0.310°)
Inertia moment	3.56×10^{-6} kgm^2	3.66×10^{-6} kgm^2
Dimension (Main frame)	57 (W) × 55 (H) × 40 (D) mm	
Weight	Approx. 270g	
Attached cable	6 wires (End points: Peeled insulator and soldered)	
Accesories	CATM51 : 5m CATM12 : 10m	
CE marking certification	EMC directives : EN61326-2-3 : 2013	

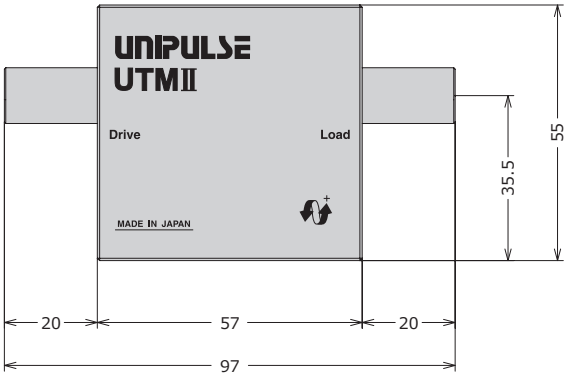
Dimension

Key groove option : UTMⅡ-5/10Nm(K)









Supported couplings
UCM30
UCM34
UCS34
UCM39
UCS39
UCM44
UCM56
UCM65

Refer to page 26 for details of couplings

Unit : mm

UTMⅡ-20Nm

Rotary encoder | Key groove

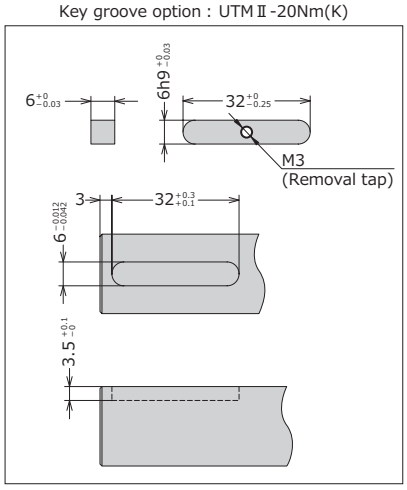
■ Specification

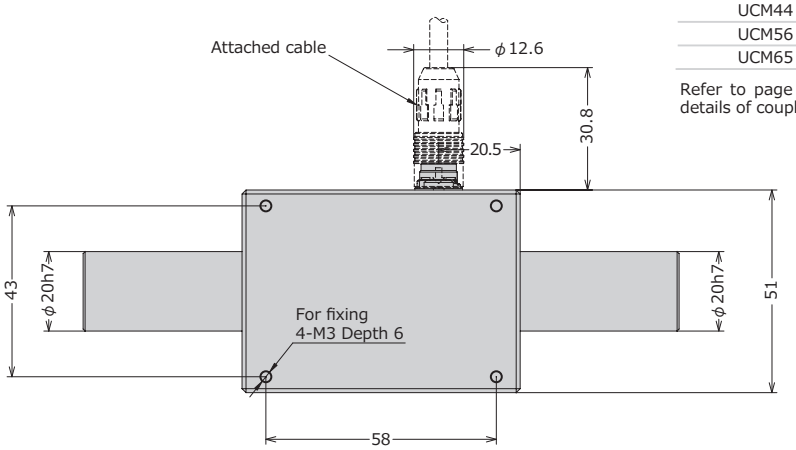
Type	UTMⅡ-20Nm
Measurement range	± 20Nm
Power supply	DC24V ± 15% Consumption current : 150mA or less
Output range	± 5V DC Load resistance must be more than 2kΩ
Responsivity	1kHz
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30V, 10mA
Safe overload	500% FS
Non-linearity	0.03% FS (Typ)
Hysteresis	0.03% FS (Typ)
Repeatability	0.03% FS (Typ)
Operation temp. range	-10 to +50℃
Temp. effect on zero	0.01%FS/℃ (Typ)
Temp. effect on span	0.01%FS/℃ (Typ)
Max. rotation speed	20000rpm

Type	UTMⅡ-20Nm
Torsional spring constant	5386Nm/rad
Maximum torsional angle	3.71×10^{-3}rad (0.213°)
Inertia moment	2.60×10^{-5} kgm^2
Dimension (Main frame)	70 (W) × 68 (H) × 51 (D) mm
Weight	Approx. 700g
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accesories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013

Dimension

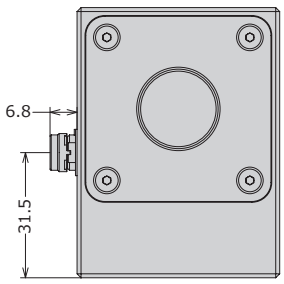
Key groove option : UTMⅡ-20Nm(K)

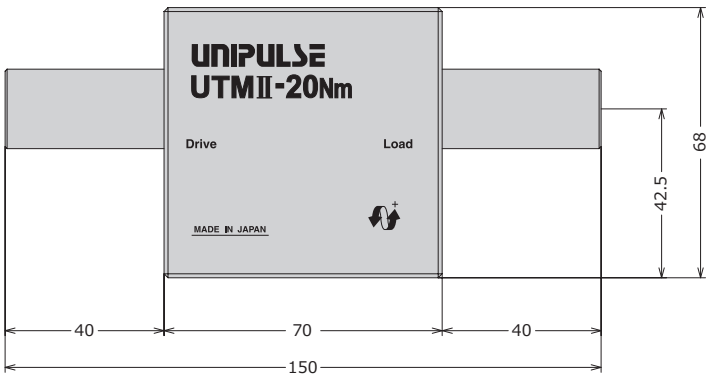




Supported couplings
UCM44
UCM56
UCM65

Refer to page 26 for details of couplings





Unit : mm

UTMⅡ-50Nm

Rotary encoder | Key groove

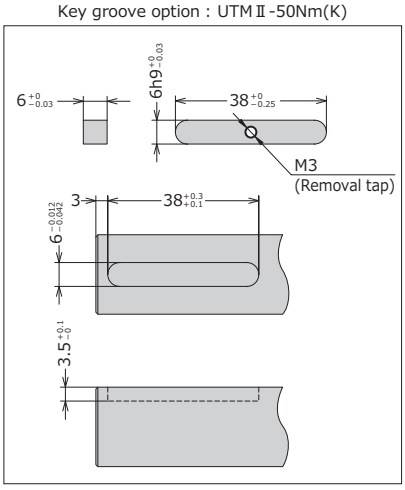
■ Specification

Type	UTMⅡ-50Nm
Measurement range	± 50Nm
Power supply	DC24V ± 15% Consumption current : 150mA or less
Output range	± 5V DC　Load resistance must be more than 2kΩ
Responsivity	1kHz
Rotation signal	4 pulses per 1 rotation Open collector　Max. ratings 30V, 10mA
Safe overload	500% FS
Non-linearity	0.03% FS（Typ）
Hysteresis	0.03% FS（Typ）
Repeatability	0.03% FS（Typ）
Operation temp. range	-10 to +50℃
Temp. effect on zero	0.01%FS/℃（Typ）
Temp. effect on span	0.01%FS/℃（Typ）
Max. rotation speed	20000rpm

Type	UTMⅡ-50Nm
Torsional spring constant	8428Nm/rad
Maximum torsional angle	5.93×10^{-3}rad (0.340°)
Inertia moment	2.67×10^{-5} kgm^2
Dimension (Main frame)	70（W）× 68（H）× 51（D）mm
Weight	Approx. 700g
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accesories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013

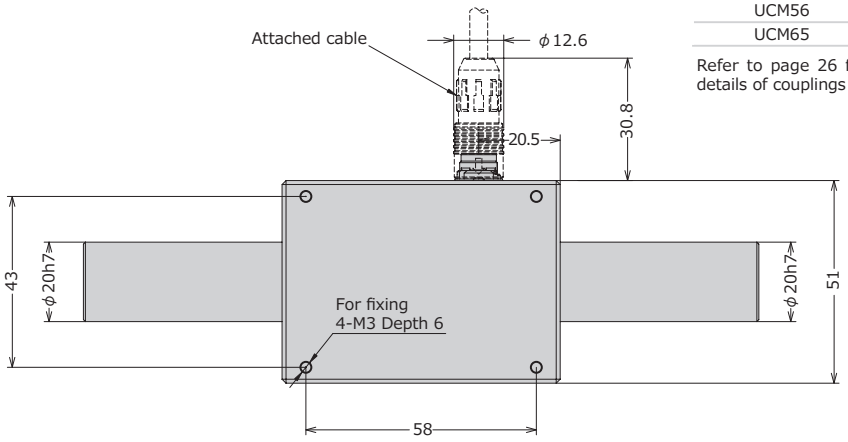
Dimension

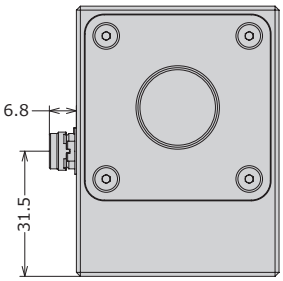
Key groove option : UTMⅡ-50Nm(K)

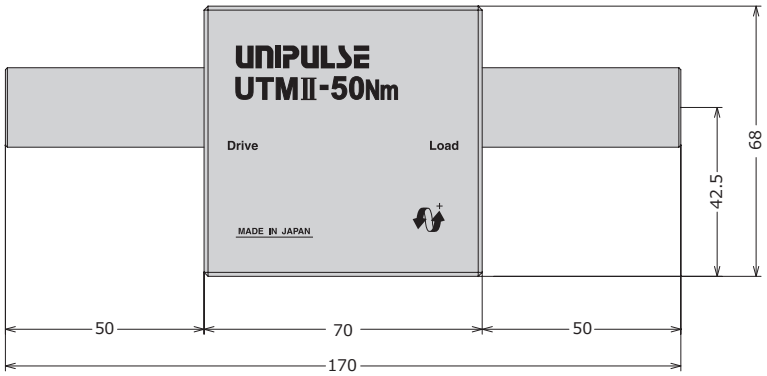


Supported couplings
UCM56
UCM65

Refer to page 26 for details of couplings







Unit : mm

UTMⅡ-100Nm

Key groove | Square drive

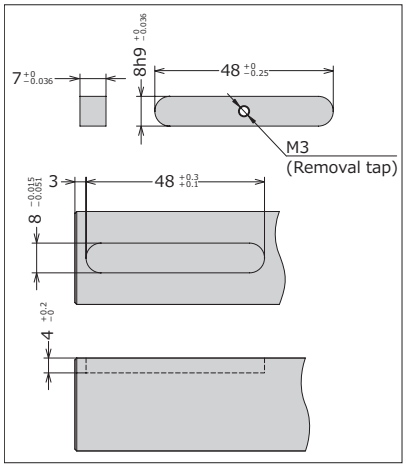
■ Specification

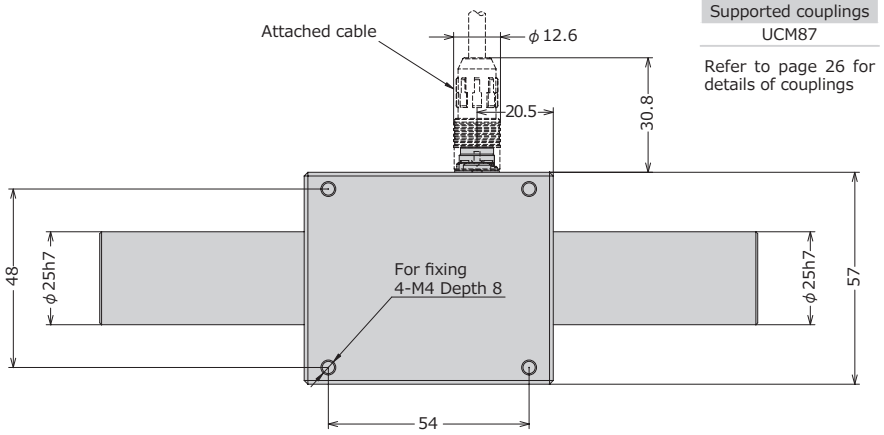
Type	UTMⅡ-100Nm
Measurement range	± 100Nm
Power supply	DC24V ± 15% Consumption current : 150mA or less
Output range	± 5V DC　Load resistance must be more than 2kΩ
Responsivity	1kHz
Rotation signal	4 pulses per 1 rotation Open collector　Max. ratings 30V, 10mA
Safe overload	500% FS
Non-linearity	0.03% FS（Typ）
Hysteresis	0.03% FS（Typ）
Repeatability	0.03% FS（Typ）
Operation temp. range	-10 to +50℃
Temp. effect on zero	0.01%FS/℃（Typ）
Temp. effect on span	0.01%FS/℃（Typ）
Max. rotation speed	15000rpm

Type	UTMⅡ-100Nm
Torsional spring constant	17.3×10^{3}Nm/rad
Maximum torsional angle	5.78×10^{-3}rad (0.331°)
Inertia moment	6.60×10^{-5} kgm^2
Dimension (Main frame)	67（W）× 74（H）× 57（D）mm
Weight	Approx. 1.1kg
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accesories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013

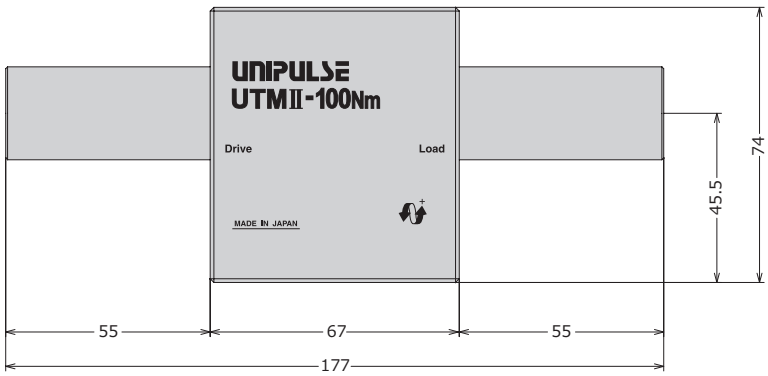
Dimension

Key groove option : UTMⅡ-100Nm(K)





Supported couplings
UCM87
Refer to page 26 for details of couplings



Unit : mm

UTMⅡ-200Nm

Key groove

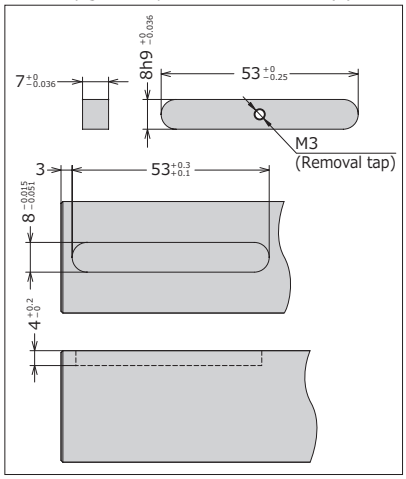
■ Specification

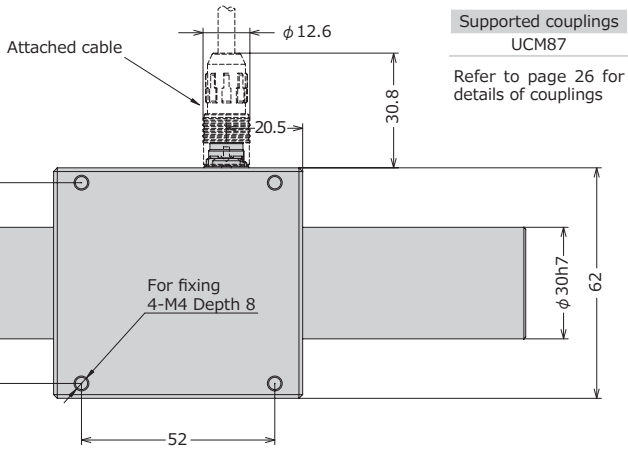
Type	UTMⅡ-200Nm
Measurement range	± 200Nm
Power supply	DC24V ± 15% Consumption current : 150mA or less
Output range	± 5V DC　Load resistance must be more than 2kΩ
Responsivity	1kHz
Rotation signal	4 pulses per 1 rotation Open collector　Max. ratings 30V, 10mA
Safe overload	500% FS
Non-linearity	0.03% FS（Typ）
Hysteresis	0.03% FS（Typ）
Repeatability	0.03% FS（Typ）
Operation temp. range	-10 to +50℃
Temp. effect on zero	0.01%FS/℃（Typ）
Temp. effect on span	0.01%FS/℃（Typ）
Max. rotation speed	12000rpm

Type	UTMⅡ-200Nm
Torsional spring constant	41.7×10^3Nm/rad
Maximum torsional angle	4.79×10^{-3}rad (0.275°)
Inertia moment	1.40×10^{-4} kgm^2
Dimension (Main frame)	67（W）× 79（H）× 62（D）mm
Weight	Approx. 1.5kg
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accesories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013

Dimension

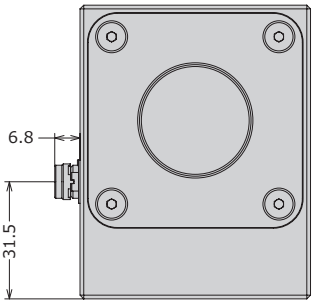
Key groove option : UTMⅡ-200Nm(K)

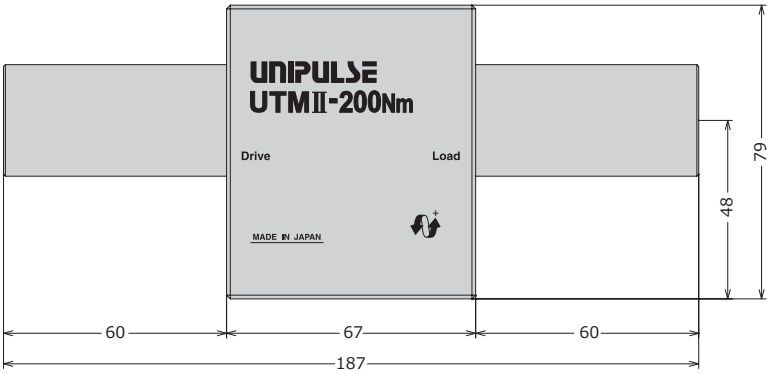




Supported couplings
UCM87

Refer to page 26 for details of couplings





Unit : mm

UTMⅡ-500Nm

Key groove | Square drive

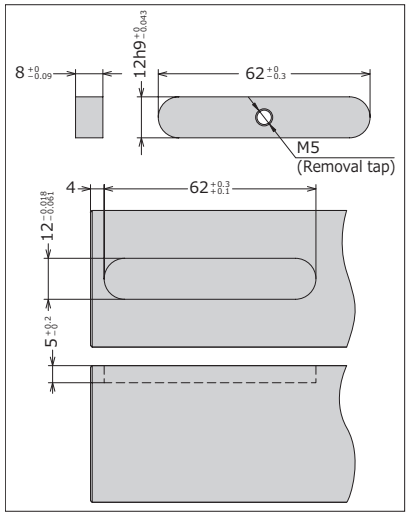
■ Specification

Type	UTMⅡ-500Nm
Measurement range	± 500Nm
Power supply	DC24V ± 15% Consumption current : 150mA or less
Output range	± 5V DC　Load resistance must be more than 2kΩ
Responsivity	1kHz
Rotation signal	4 pulses per 1 rotation Open collector　Max. ratings 30V, 10mA
Safe overload	500% FS
Non-linearity	0.03% FS（Typ）
Hysteresis	0.03% FS（Typ）
Repeatability	0.03% FS（Typ）
Operation temp. range	-10 to +50℃
Temp. effect on zero	0.01%FS/℃（Typ）
Temp. effect on span	0.01%FS/℃（Typ）
Max. rotation speed	10000rpm

Type	UTMⅡ-500Nm
Torsional spring constant	117 × 10^3Nm/rad
Maximum torsional angle	4.28 × 10^{-3}rad (0.246°)
Inertia moment	4.70 × 10^{-4} kgm^2
Dimension (Main frame)	67（W）× 79（H）× 72（D）mm
Weight	Approx. 2.6kg
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accesories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013

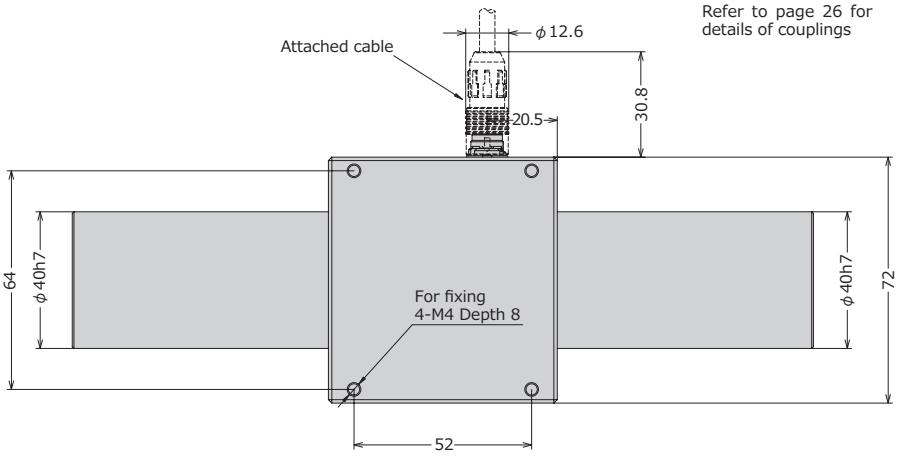
Dimension

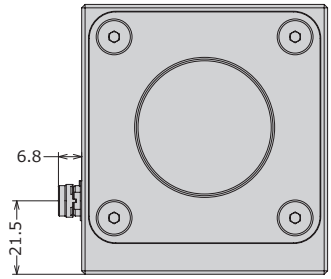
Key groove option : UTMⅡ-500Nm(K)

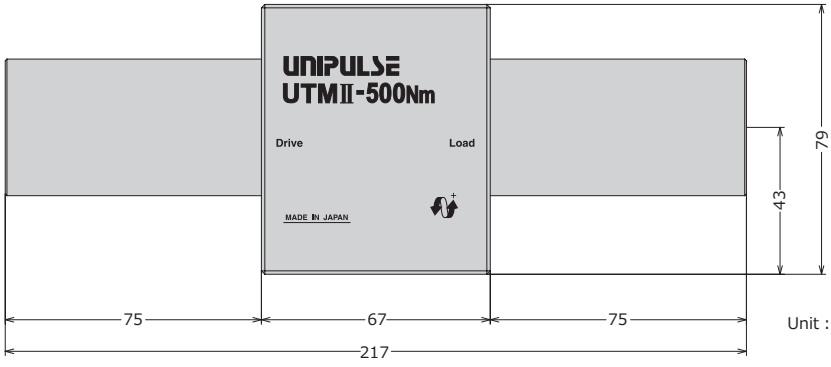


Supported couplings
UCM150
UCM170

Refer to page 26 for details of couplings







Unit : mm

UTMⅡ-1000Nm

Key groove

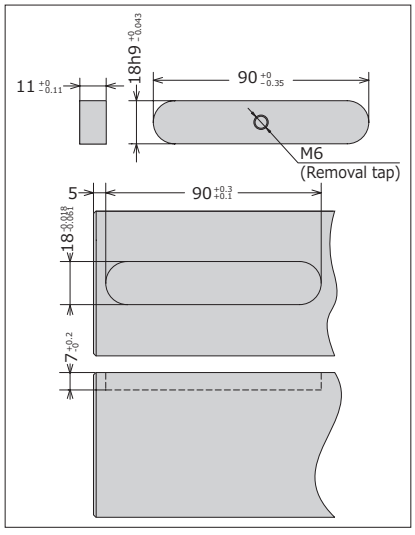
■ Specification

Type	UTMⅡ-1000Nm
Measurement range	± 1000Nm
Power supply	DC24V ± 15% Consumption current : 160mA or less
Output range	± 5V DC　Load resistance must be more than 2kΩ
Responsivity	1kHz
Rotation signal	4 pulses per 1 rotation Open collector　Max. ratings 30V, 10mA
Safe overload	500% FS
Non-linearity	0.03% FS（Typ）
Hysteresis	0.03% FS（Typ）
Repeatability	0.03% FS（Typ）
Operation temp. range	-10 to +50℃
Temp. effect on zero	0.01%FS/℃（Typ）
Temp. effect on span	0.01%FS/℃（Typ）
Max. rotation speed	7000rpm

Type	UTMⅡ-1000Nm
Torsional spring constant	377 × 10^3Nm/rad
Maximum torsional angle	2.65 × 10^{-3}rad (0.152°)
Inertia moment	2.90 × 10^{-3} kgm^2
Dimension (Main frame)	86（W）× 103（H）× 98（D）mm
Weight	Approx. 7.3kg
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accesories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013

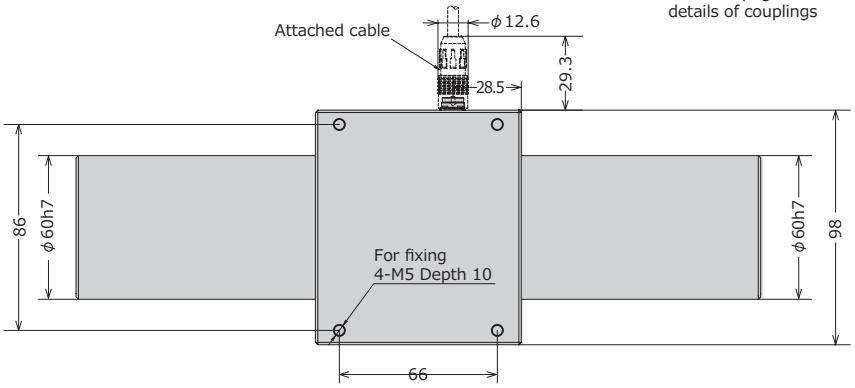
Dimension

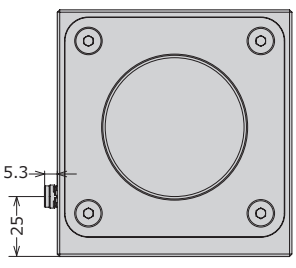
Key groove option : UTMⅡ-1000Nm(K)

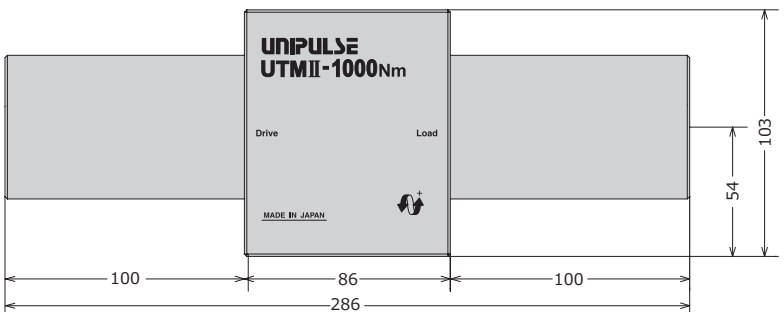


Supported couplings
UCM170
UCM220

Refer to page 26 for details of couplings



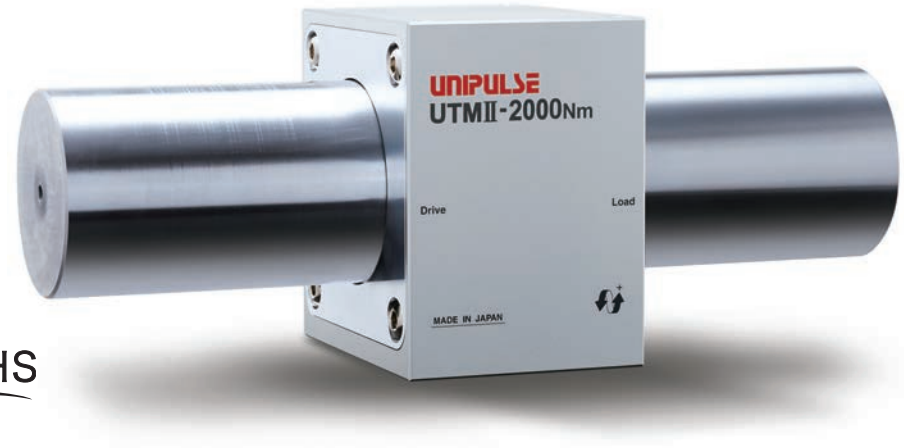




Unit : mm

UTMⅡ-2000Nm

Key groove



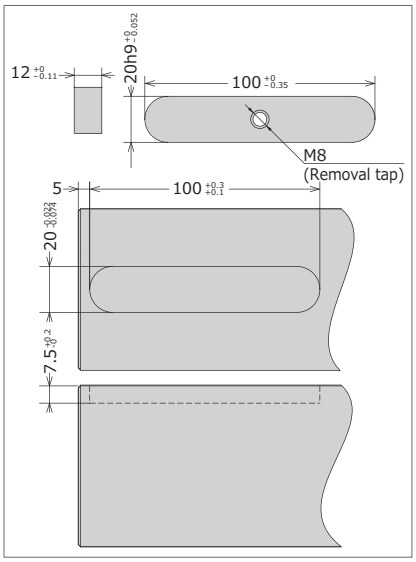
■ Specification

Type	UTMⅡ-2000Nm
Measurement range	± 2000Nm
Power supply	DC24V ± 15% Consumption current : 160mA or less
Output range	± 5V DC　Load resistance must be more than 2kΩ
Responsivity	1kHz
Rotation signal	4 pulses per 1 rotation Open collector　Max. ratings 30V, 10mA
Safe overload	500% FS
Non-linearity	0.03% FS（Typ）
Hysteresis	0.03% FS（Typ）
Repeatability	0.03% FS（Typ）
Operation temp. range	-10 to +50℃
Temp. effect on zero	0.01%FS/℃（Typ）
Temp. effect on span	0.01%FS/℃（Typ）
Max. rotation speed	6000rpm

Type	UTMⅡ-2000Nm
Torsional spring constant	717 × 10^3Nm/rad
Maximum torsional angle	2.79 × 10^{-3}rad (0.160°)
Inertia moment	5.89 × 10^{-3} kgm^2
Dimension (Main frame)	86（W）× 119（H）× 111（D）mm
Weight	Approx. 10.5kg
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accesories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013

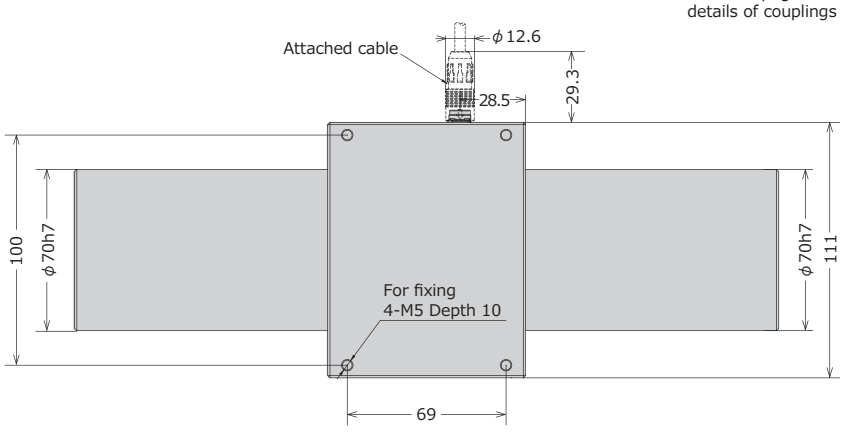
Dimension

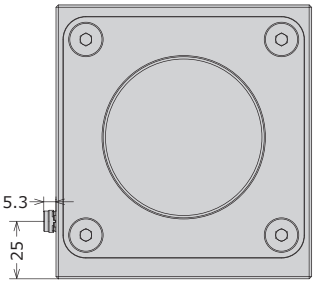
Key groove option : UTMⅡ-2000Nm(K)

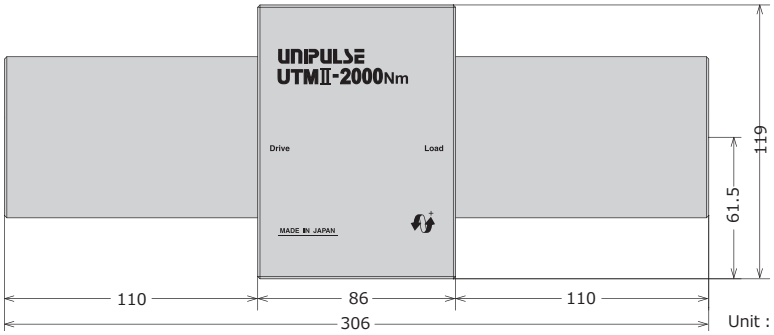


Supported couplings
UCM220
UCM260

Refer to page 26 for details of couplings







Unit : mm

UTMⅡ-5000Nm

Key groove

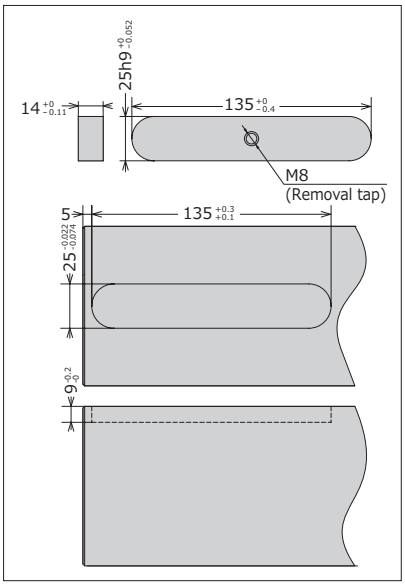
■ Specification

Type	UTMⅡ-5000Nm
Measurement range	± 5000Nm
Power supply	DC24V ± 15% Consumption current : 160mA or less
Output range	± 5V DC　Load resistance must be more than 2kΩ
Responsivity	1kHz
Rotation signal	4 pulses per 1 rotation Open collector　Max. ratings 30V, 10mA
Safe overload	500% FS
Non-linearity	0.03% FS（Typ）
Hysteresis	0.03% FS（Typ）
Repeatability	0.03% FS（Typ）
Operation temp. range	-10 to +50℃
Temp. effect on zero	0.01%FS/℃（Typ）
Temp. effect on span	0.01%FS/℃（Typ）
Max. rotation speed	5000rpm

Type	UTMⅡ-5000Nm
Torsional spring constant	1649 × 10^3Nm/rad
Maximum torsional angle	3.03 × 10^{-3}rad (0.174°)
Inertia moment	2.01 × 10^{-2} kgm^2
Dimension (Main frame)	97（W）× 141（H）× 137（D）mm
Weight	Approx. 21.4kg
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accesories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013

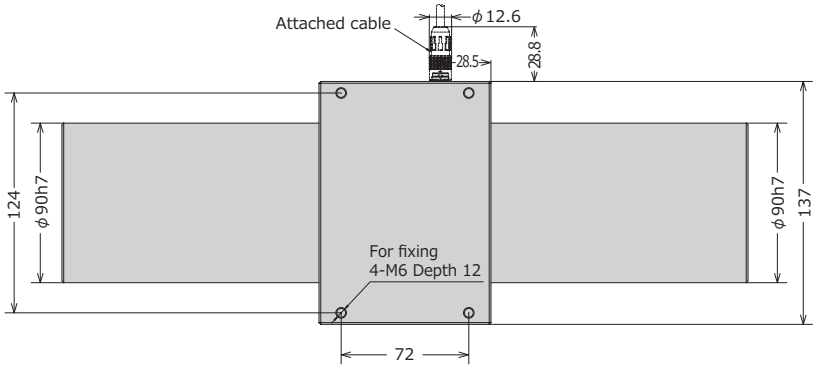
Dimension

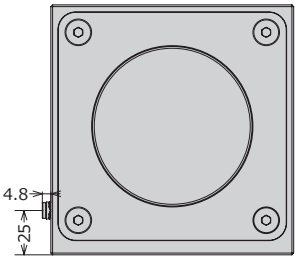
Key groove option : UTMⅡ-5000Nm(K)

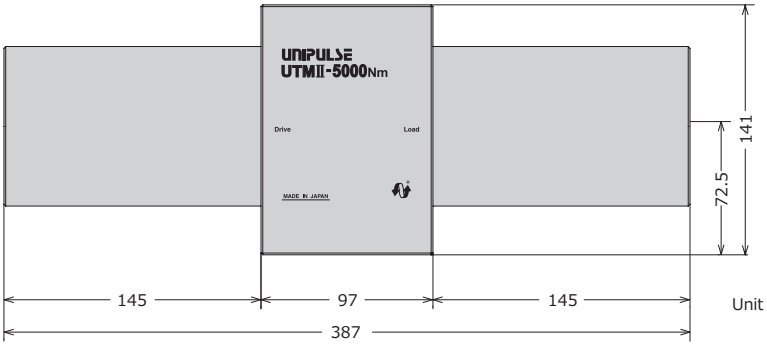


Supported couplings
UCM260

Refer to page 26 for details of couplings



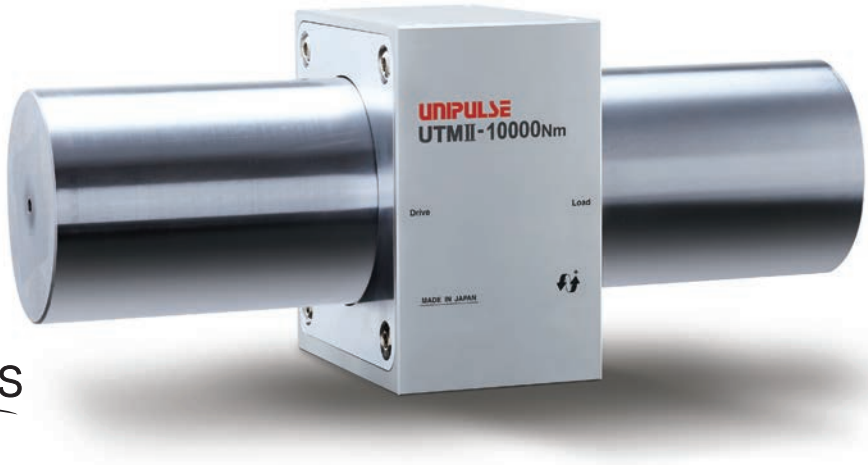




Unit : mm

UTMⅡ-10000Nm

Key groove



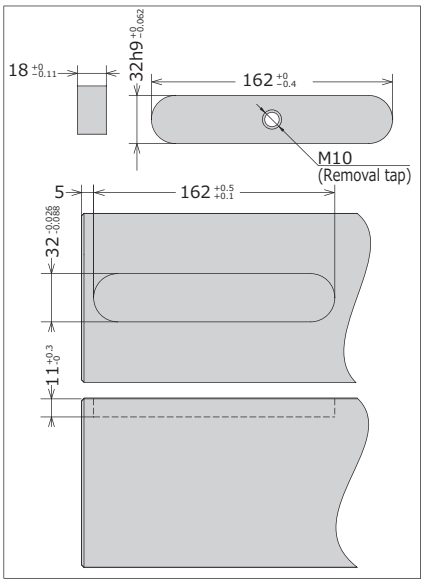
■ Specification

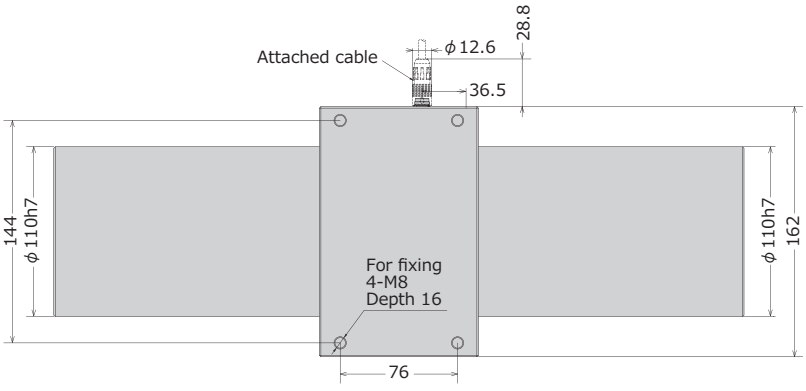
Type	UTMⅡ-10000Nm
Measurement range	± 10000Nm
Power supply	DC24V ± 15% Consumption current : 160mA or less
Output range	± 5V DC　Load resistance must be more than 2kΩ
Responsivity	1kHz
Rotation signal	4 pulses per 1 rotation Open collector　Max. ratings 30V, 10mA
Safe overload	500% FS
Non-linearity	0.03% FS（Typ）
Hysteresis	0.03% FS（Typ）
Repeatability	0.03% FS（Typ）
Operation temp. range	-10 to +50℃
Temp. effect on zero	0.01%FS/℃（Typ）
Temp. effect on span	0.01%FS/℃（Typ）
Max. rotation speed	4000rpm

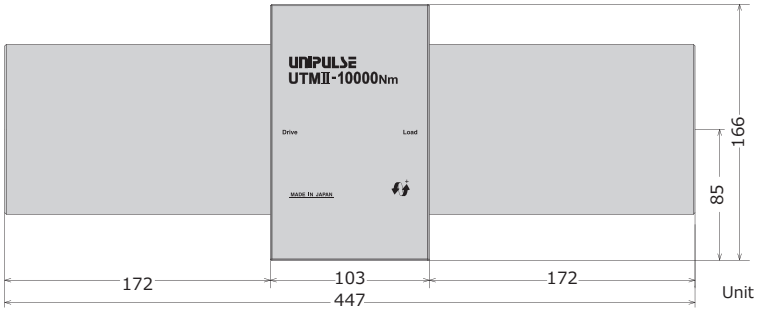
Type	UTMⅡ-10000Nm
Torsional spring constant	3255×10^3Nm/rad
Maximum torsional angle	3.07×10^{-3}rad (0.176°)
Inertia moment	5.16×10^{-2} kgm^2
Dimension (Main frame)	103（W）× 166（H）× 162（D）mm
Weight	Approx. 36kg
Attached cable	6 wires (End points: Peeled insulator and soldered)
Accesories	CATM51 : 5m CATM12 : 10m
CE marking certification	EMC directives : EN61326-2-3 : 2013

Dimension

Key groove option : UTMⅡ-10000Nm(K)







Unit : mm

Option (To be specified at the time of order)

Rotary encoder

Type
UTMⅡ- 0.05Nm(R)
UTMⅡ- 0.1Nm(R)
UTMⅡ- 0.2Nm(R)
UTMⅡ- 0.5Nm(R)
UTMⅡ- 1Nm(R)
UTMⅡ- 2Nm(R)
UTMⅡ- 5Nm(R) ※
UTMⅡ- 10Nm(R) ※
UTMⅡ- 20Nm(R)
UTMⅡ- 50Nm(R)

■ Optical encoder

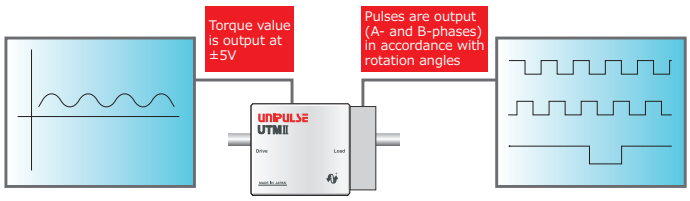
2000C/T : 0.05 to 10Nm
1440C/T : 20Nm, 50Nm

■ Suitable for measurement of torque variation against an angular variation

* Maximum rotation speed
4500rpm : 0.05 to 10Nm
2000rpm : 20Nm, 50Nm

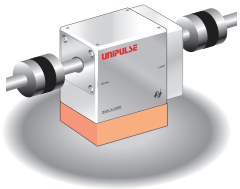
* Key grooves are optionally available to the 5Nm and 10Nm models, indicated as UTMⅡ- 5Nm(RK) and UTMⅡ- 10Nm(RK), respectively.

■ Torque signals (analog ± 5V) and rotation angle signals (A-phase, B-phase, Z-phase photo-coupler outputs) are output.



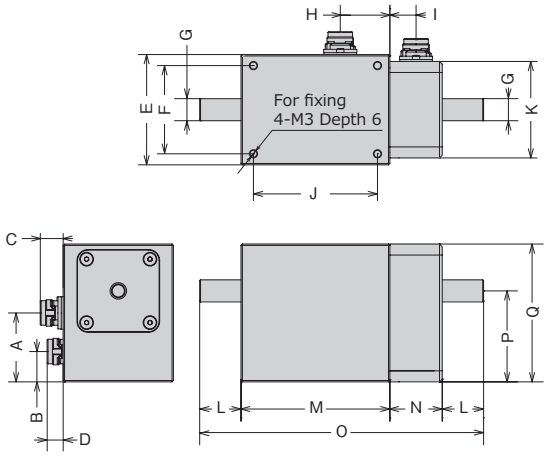
■ Installation

Fix the main unit loosely to prevent angular error induced by rotation of the main unit.



Dimension

■ UTMⅡ-0.05Nm (R) to 50Nm (R)



Range	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
0.05	25	11	8.3	6.8	40	32	ϕ5h7	18	9.5	45	35	10	54	19	93	33	50
0.1																	
0.2																	
0.5				5.8			ϕ8h7					15			103		
1																	
2																	
5		13.5		6.8		34	ϕ12h7	19.5			37	20	57		116	35.5	55
10																	
20	31.5	13	6.8	8.5	51	43	ϕ20h7	20.5	7	58	51	40	70	17	167	42.5	68
50												50			187		

Unit : mm

Key groove

Type
UTMⅡ- 5Nm(K) ※
UTMⅡ- 10Nm(K) ※
UTMⅡ- 20Nm(K)
UTMⅡ- 50Nm(K)
UTMⅡ- 100Nm(K)
UTMⅡ- 200Nm(K)
UTMⅡ- 500Nm(K)
UTMⅡ- 1000Nm(K)
UTMⅡ- 2000Nm(K)
UTMⅡ- 5000Nm(K)
UTMⅡ- 10000Nm(K)

Refer to each product page (page 7 to 16) for external dimensions.

* Rotary encoders are optionally available to the 5Nm and 10Nm models, indicated as UTMⅡ- 5Nm(RK) and UTMⅡ- 10Nm(RK), respectively.

Square drive

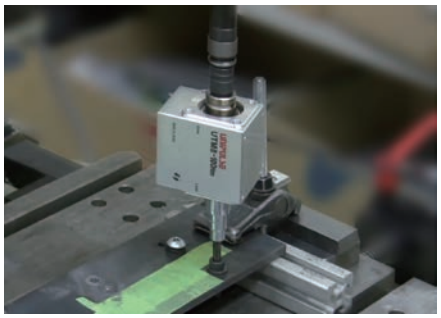
Type
UTMⅡ- 100Nm(W)
UTMⅡ- 500Nm(W)

Reliable and stable measurement without missing data by wireless signal transmission.

- Ideal to use with nut runner applications (fastening tools).
- With high accuracy and high-speed response of UTMⅡ, torque fluctuation can be monitored in a fastening process.

* This product is not for impact wrenches.

- Torque can be monitored easily just by setting the sensor between socket and shaft of a nut runner.



Drive (nut runner)

Load (socket)

■ Specification

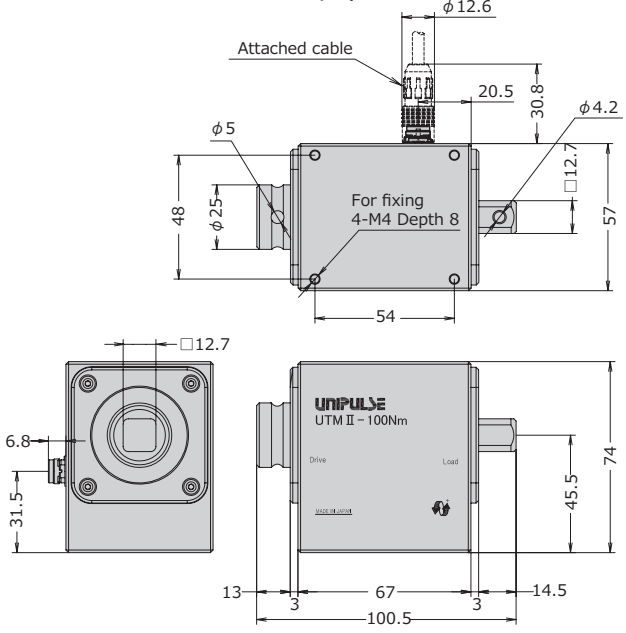
Type	UTMⅡ-100Nm (W)	UTMⅡ-500Nm (W)
Measurement range	± 100Nm	± 500Nm
Power supply	DC24V ± 15% Consumption current : 150mA or less	
Output range	± 5V DC Load resistance must be more than 2kΩ	
Responsivity	1kHz	
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30V, 10mA	
Safe overload	500% FS	
Non-linearity	0.03% FS (Typ)	
Hysteresis	0.03% FS (Typ)	
Repeatability	0.03% FS (Typ)	
Operation temp. range	-10 to +50℃	
Temp. effect on zero	0.01%FS/℃ (Typ)	
Temp. effect on span	0.01%FS/℃ (Typ)	
Max. rotation speed	15000rpm	8000rpm

Type	UTMⅡ-100Nm (W)	UTMⅡ-500Nm (W)
Torsional spring constant	3.85×10^3Nm/rad	265×10^3Nm/rad
Maximum torsional angle	2.60×10^{-3}rad (0.149°)	1.88×10^{-3}rad (0.108°)
Inertia moment	0.38 kgcm^2	2.15 kgcm^2
Shaft	□ 12.7mm	□ 19.05mm
Weight	Approx. 0.8kg	Approx. 1.4kg
Attached cable	6 wires (End points: Peeled insulator and soldered)	
Accesories	CATM51 : 5m CATM12 : 10m	
CE marking certification	EMC directives : EN61326-2-3 : 2013	

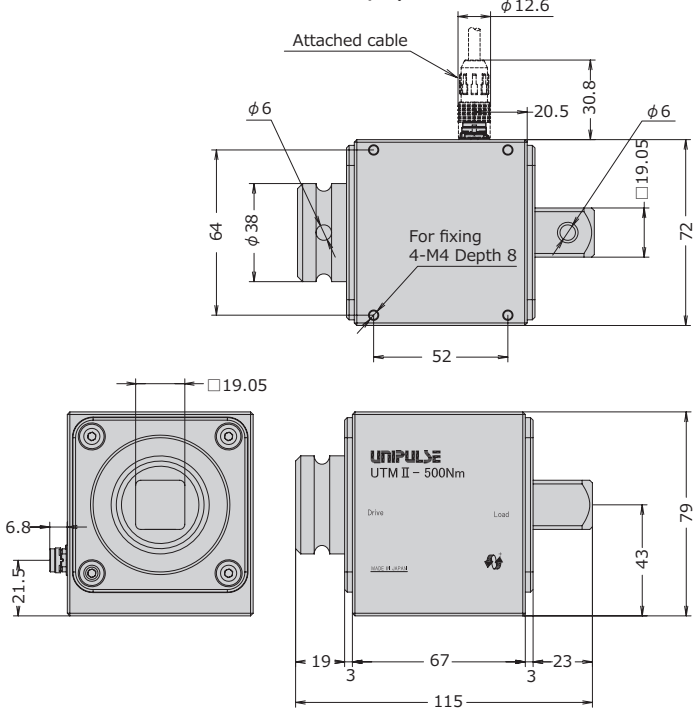
Dimension

Unit : mm

■ UTMⅡ-100Nm (W)

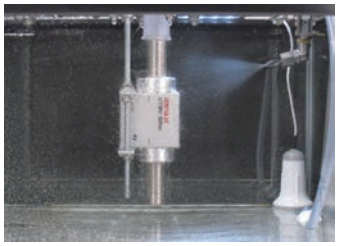


■ UTMⅡ-500Nm (W)



UTMV (drip & rust proof type)

Drip & rust proof type with high safe overload rating for use in harsh conditions

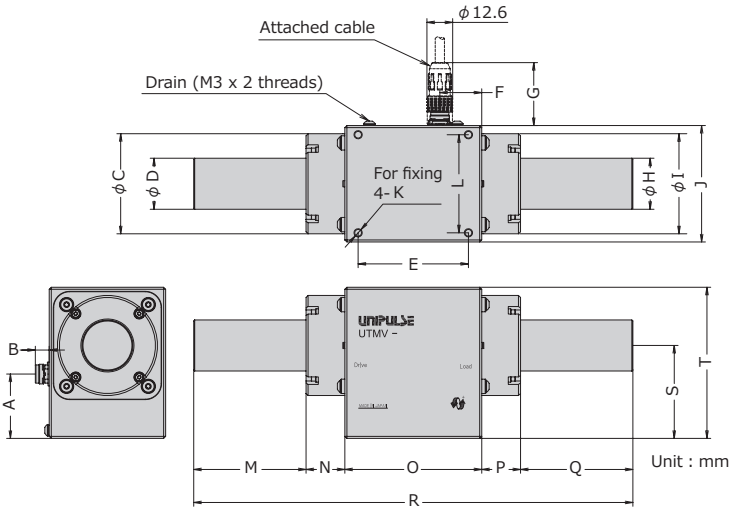


- Degree of protection: equivalent to IP65
- Made of rust-resistant stainless steel
- Labyrinth seal (standard)
  With the protection against rain and seawater, it can be used outside for wind and water turbine and so on.
- PTFE rotary seal: option (S)
  It can be used in environment with dust and/or oil mist as well.
- Key groove : option (K)

■ Specification (ST:Standard, (S):PTFE rotary seal option)

Measurement range	± 0.1Nm		± 0.5Nm		± 1Nm		± 5Nm		± 10Nm		± 50Nm		± 100Nm		± 500Nm		± 1000Nm		± 5000Nm	
Seal structure	ST	(S)	ST	(S)	ST	(S)	ST	(S)	ST	(S)	ST	(S)	ST	(S)	ST	(S)	ST	(S)	ST	(S)
Power supply	DC24V ± 15%																			
Consumption current	100mA or less										150mA or less						160mA or less			
Output range	± 5V DC Load resistance must be more than 2kΩ																			
Responsivity	1kHz																			
Rotation signal	4 pulses per 1 rotation Open collector Max. ratings 30V, 10mA																			
Safe overload	500% FS																			
Non-linearity	0.03% FS (Typ)																			
Hysteresis	0.03% FS (Typ)																			
Repeatability	0.03% FS (Typ)																			
Operation temp. range	-10 to +50℃																			
Temp. effect on zero	0.01%FS/℃ (Typ)																			
Temp. effect on span	0.01%FS/℃ (Typ)																			
Max. rotation speed (rpm)	10000	2120	10000	1590	10000	1590	9000	1060	9000	1060	5700	680	4800	570	4800	380	4800	270	4000	180
Torsional spring constant (Nm/rad)	11.13		89.5		172		897		1400		6887		16.4×10^3		93.6×10^3		326×10^3		1418×10^3	
Maximum torsional angle (rad)	8.99×10^{-3} (0.515°)		5.59×10^{-3} (0.320°)		5.83×10^{-3} (0.334°)		5.58×10^{-3} (0.320°)		7.14×10^{-3} (0.409°)		7.26×10^{-3} (0.416°)		6.11×10^{-3} (0.350°)		5.34×10^{-3} (0.306°)		3.07×10^{-3} (0.176°)		3.53×10^{-3} (0.202°)	
Inertia moment (kgm^2)	1.15×10^{-6}	0.99×10^{-6}	2.19×10^{-6}	1.90×10^{-6}	2.22×10^{-6}	1.93×10^{-6}	5.60×10^{-6}	4.90×10^{-6}	5.70×10^{-6}	5.00×10^{-6}	4.21×10^{-5}	3.86×10^{-5}	9.6×10^{-5}	10.9×10^{-5}	6.2×10^{-4}	6.1×10^{-4}	3.56×10^{-3}	3.51×10^{-3}	2.38×10^{-2}	2.34×10^{-2}
Approx. weight	390g		430g		430g		580g		580g		1.6kg		2.1kg		4.0kg		10.5kg		28.3kg	
Attached cable	6 wires (End points: Peeled insulator and soldered)																			
Accesories	CATM51 : 5m CATM12 : 10m																			
CE marking certification	EMC directives : EN61326-2-3 : 2013																			

Dimension



Type
UTMV- 0.1Nm
UTMV- 0.1Nm(S)
UTMV- 0.5Nm
UTMV- 0.5Nm(S)
UTMV- 1Nm
UTMV- 1Nm(S)
UTMV- 5Nm
UTMV- 5Nm(K)
UTMV- 5Nm(S)
UTMV- 5Nm(SK)
UTMV- 10Nm
UTMV- 10Nm(K)
UTMV- 10Nm(S)
UTMV- 10Nm(SK)
UTMV- 50Nm
UTMV- 50Nm(K)
UTMV- 50Nm(S)
UTMV- 50Nm(SK)

Type
UTMV- 100Nm
UTMV- 100Nm(K)
UTMV- 100Nm(S)
UTMV- 100Nm(SK)
UTMV- 500Nm
UTMV- 500Nm(K)
UTMV- 500Nm(S)
UTMV- 500Nm(SK)
UTMV- 1000Nm
UTMV- 1000Nm(K)
UTMV- 1000Nm(S)
UTMV- 1000Nm(SK)
UTMV- 5000Nm
UTMV- 5000Nm(K)
UTMV- 5000Nm(S)
UTMV- 5000Nm(SK)

Measurement range	A	B	ϕ C	ϕ D	E	F	G	ϕ H	ϕ I	J	K	L	M	N	O	P	Q	R	S	T	Key groove
0.1	25	8.3	24	5h7	45	18	32.3	5h7	24	40	M3 Depth 6	32	10	11.5	54	11.5	10	97	33	50	–
0.5	25	8.3	26	8h7	45	18	32.3	8h7	26	40	M3 Depth 6	32	15	11.5	54	11.5	15	107	33	50	–
1	25	8.3	26	8h7	45	18	32.3	8h7	26	40	M3 Depth 6	32	15	11.5	54	11.5	15	107	33	50	–
5	25	8.3	30.5	12h7	45	19.5	32.3	12h7	30.5	40	M3 Depth 6	34	20	12	57	12	20	121	35.5	55	Refer to Page 7
10	25	8.3	30.5	12h7	45	19.5	32.3	12h7	30.5	40	M3 Depth 6	34	20	12	57	12	20	121	35.5	55	Refer to Page 7
50	31.5	6.8	43.4	20h7	58	20.5	30.8	20h7	43.4	51	M3 Depth 6	43	50	18.5	70	18.5	50	207	42.5	68	Refer to Page 9
100	31.5	6.8	49	25h7	54	20.5	30.8	25h7	49	57	M4 Depth 8	48	55	19	67	19	55	215	45.5	74	Refer to Page 10
500	21.5	6.8	64.2	40h7	52	20.5	30.8	40h7	64.2	72	M4 Depth 8	64	75	20	67	20	75	257	43	79	Refer to Page 12
1000	25	5.3	86.6	60h7	66	28.5	29.3	60h7	86.6	98	M5 Depth 10	86	100	20	86	20	100	326	54	103	Refer to Page 13
5000	25	4.8	124.6	90h7	72	28.5	28.8	90h7	124.6	137	M6 Depth 12	124	145	23	97	23	145	433	72.5	141	Refer to Page 15

※ Dimension of rotary seal type is same as standard type.

Accessories

UCM/UCS　Coupling

- Recommended couplings for UTMⅡ/UTMV
- Connecting to external shafts accurately.
- Preventing rotational resonance, and improving accuracy of torque measurement (rubber type).

* Refer to page 26 for details of couplings

UCM15-3*5G
- Material type（G：Rubber, M：Metal）
- D1*D2
- Diameter φA（φ15, φ19, φ25,・・・）
- Length type（M：Middle, S：Short）

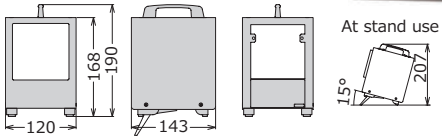
TM301　Torque monitor - basic type, simple and easy operation

RoHS　USB　PC SOFT　CASE

- Torque monitor for UTMⅡ/UTMV.
- Torque, rotation speed and power* are displayed simultaneously.
- Upper/lower comparators with hold functions.
- Data storage function.
- Easy connection to UTMⅡ/UTMV with one cable.
- The unit supplies electric power to UTMⅡ/UTMV.

* Power（W）＝ 2π × Torque（Nm）× Rotation speed（rpm）/ 60

- Special case　DTC2-PSL



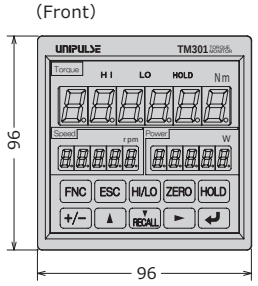
Analog	・Torque sensor input (voltage input)	
	Signal input range	−5 to +5V　input impedance : 1MΩ or more
	Accuracy	Non-linearity : Within 0.02%FS±1digit Zero drift : Within 0.2mV/℃ RTI Gain drift : Within 0.01%/℃
	Analog filter	Low pass filter（−6dB/oct.）Select from 3, 30, 300, 1kHz
	Data output rate	300 times/sec.
		Resolution : 24bit（binary）Approx. 1/30000 with respect to 5V
	Monitor output	Output level : Input voltage cuff (For test point)
	・Pulse input for rpm (input for open collector type) Maximum input frequency: Compatible with the pulse output frequency of UTMⅡ/UTMV series Minimum input frequency: Select from 15, 10, 5, 3, or 2 rpm (when pulse rate is 4 ppr) 60, 40, 20, 12, 8 rpm (when pulse rate is 1 ppr) Minimum pulse width: 50μs Circuit layout　No-voltage (dry) contact input (minus common): open collector outputs can be connected (Ic= approx. 10mA)	
Display	Display unit	Main display : Character height 15mm 7-segment Green LED（5-digit+Sign） Sub display : Character height 8mm 7-segment Green LED（5-digit） ※Unit seal is attached.
External I/O signal	External output（7）	Upper/Lower limit comparison(ALM HI、HI、OK、LO、ALM LO)／Hold complete／RUN
	External input（4）	Hold control／Hold release／Digital zero(DZ)／Memory clear
Interface	Standard : SIF Option : BCD output／D/A converter voltage output／D/A converter current output／RS-232C／USB	
General performance	Power supply	AC100V to 240V（+10%−15%）(free power source 50/60Hz)
	Power consumption	7W typ
	Operating conditions	Temperature : Operation −10℃ to +40℃　Storage −40℃ to +80℃ Humidity : 85%RH or less (non-condensing)
	Dimension	96(W)× 96(H)× 138(D)mm（Projections excluded）
	Weight	Approx. 1.0kg
Attachment	Operation manual･･･1, External input/output connector･･･1, AC input cord 3m (with solderless terminal)*･･･1, Cable for connecting UTMⅡ/UTMV 2m･･･1, Unit seal･･･1, Connector for BCD output (with BCD output option)･･･1, Mini screwdriver (with D/A converter option)･･･1 * The attached AC input cord is intended for 100V AC power in Japan.	
Accessories	CA372-I/O:Cable with FCN connector at one-end 3m CAAC2P-B3:AC Supply cord 3m CATM21-M:Cable for connecting UTMⅡ/UTMV 2m CN34:D-Sub9p connector for RS-232C CN51:BCD output connector CN90:Waterproof plastic connector for UTMⅡ/UTMV GMP96x96 : Rubber seal	CA81-USB:miniUSB-computer USB cable 1.8m CAAC3P-CEE7/7-B2:AC Supply cord (250V)2m CATM51-M:Cable for connecting UTMⅡ/UTMV 5m CN50:FCN series I/O connector (with cover) CN55:FCN series I/O connector (with diagonal cover) DTC2-PSL:Case for TM301

PC Software

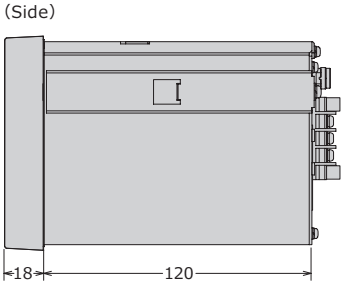
PC software for parameter settings (save and edit), graph display, and calibration can be downloaded from our website (USB interface option for TM301 is required).

Dimension

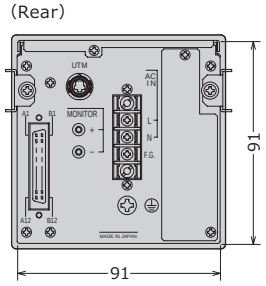
(Front)

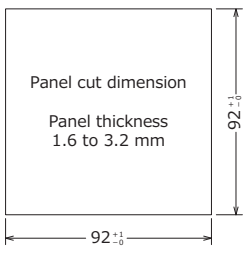


(Side)



(Rear)

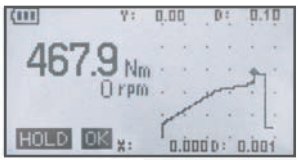




TM400　Torque monitor - portable with built-in battery, compact & high-spec type

CE RoHS　20kHz SAMPLING　PULSE IN　USB　PC SOFT

- ■ Convenient portable monitor for easy use of UTMⅡ/UTMV.
- ■ Ideal for on-site calibration of nut runners (use with UTMⅡ with the square drive option).
- ■ With the built-in battery, it can be operated even without power source.
- ■ Easy connection to UTMⅡ/UTMV with one cable.
- ■ Operation power can be supplied to the UTMⅡ/UTMV. (also to an optional rotary encoder).
- ■ High-speed sampling at 20kS/s
- ■ Torque & rotation speed and torque-angle curve can be monitored.
- ■ Data recording with memory function and USB.
- ■ Various display mode: real-time, graph, recorded data, etc….
- ■ Upper/lower limit & hold function.
- ■ Change the display mode by pressing the ESC button.



Graph display

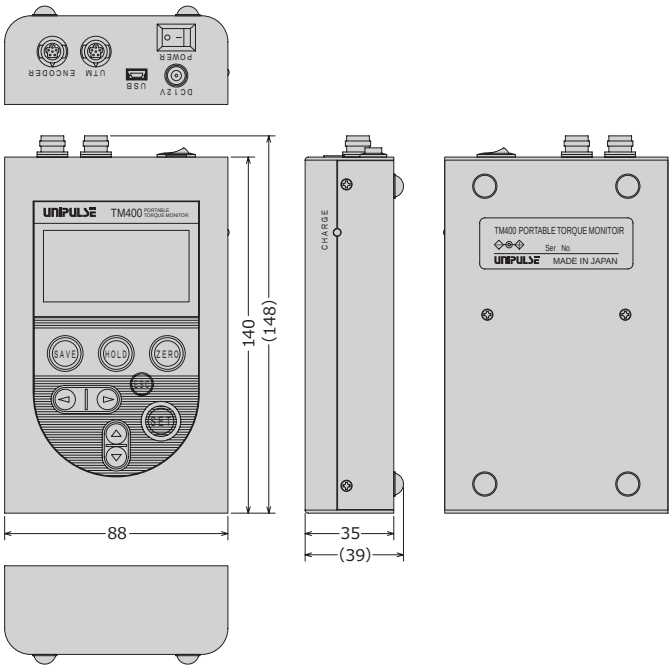
Indicated value display

Torque input	・voltage input	
	Signal input range -5 to +5V Input impedance : 1MΩ or more	
	Accuracy	Non-linearity : within 0.02%FS±1digit Zero drift : within 0.2mV/℃ RTI Gain drift : within 0.01%/℃
	Analog filter	Low pass filter (－6dB/oct.) Select from 10, 30, 100, 300, 1k, 3k, 10k, 30kHz
	A/D converter	Rate : 20000times/sec Resolution : 24bit (binary) Approx. 1/30000 against 5V
Rotation input	・Pulse input (open-collector)	
	Maximum input frequency: In accordance with the output frequency of the UTMⅡ/UTMV series	
	Minimum input frequency: 15rpm	
	Minimum detection pulse width: 50μs	
	Circuit configuration No-voltage contact input (minus common) Open collector connectable (Ic＝Approx. 10mA)	
Encoder input	・Pulse input (open-collector) Maximum input frequency: 50kHz	
Display	Display unit	128×64 dots monochromatic LCD (display area: 28 x 57)
	Displayed data	Torque & rotation speed (numeric), torque-time or torque-angle/displacement curve (graphic), and status display (high, low, OK, and hold)
Interface	USB	
Power supply	Built-in secondary battery, maximum operating time: 5 hours, AC adopter	
Operating conditions	Temperature	Operation temperature －10℃ to +40℃ Storage temperature －20℃ to +60℃
	Humidity	85%RH or below (non-condensing)
Dimension	88(W)× 140(H)× 35(D)mm (excluding projections)	
Weight	Approx.500g	
Attachment	AC adopter……1 Operation manual……1 Cable for connecting UTMⅡ/UTMV (2m)……1 Cable for connecting UTMⅡ rotary encoder (2m)……1	
Accessories	AP12375: AC adopter (100V) CA81-USB: miniUSB-computer USB cable 1.8m CATM21-M: Cable for connecting UTMⅡ/UTMV 2m CATM51-M: Cable for connecting UTMⅡ/UTMV 5m CATM(R)21: Cable for UTMⅡ with rotary encoder connection (non-connector at one end) 2m CATM(R)21-M: Cable for connecting UTMⅡ rotary encoder 2m CATM(R)51-M: Cable for connecting UTMⅡ rotary encoder 5m CN90 : Waterproof plastic connector for UTMⅡ/UTMV CN91 : Waterproof plastic connector for UTMⅡ rotary encoder	
CE marking certification	・EMC directives : EN61326-1 : 2013 ・Safety standard : EN62311 : 2008 Please specify requirement for CE marking certified product when making your order.	

PC Software

PC software for importing parameter settings and hold/waveform data from TM400 can be downloaded from our website.

Dimension



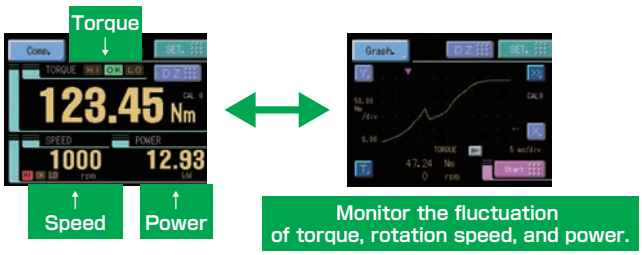
TM700 Torque monitor - high-speed sampling at 20kS/s, support the full performance of UTMⅡ/UTMV

CE RoHS 20kHz SAMPLING PULSE IN USB PC SOFT CASE

- High-speed sampling at 20kS/s!!
- A toque curve monitor supporting the high response time of UTMⅡ/UTMV (1kHz).
- Display the curves of torque, rotation speed, and power.
- Enable the cogging torque measurement with UTMⅡ/UTMV .
- Upper/lower limits & hold function.
- Operation power can be supplied to the UTMⅡ/UTMV .
- Easy connection to UTMⅡ/UTMV with one cable.
- Data recording with USB.

Torque input	・Voltage input
	Signal input range-5 to +5V Input impedance : 1MΩ or more
	Accuracy Non-linearity : within 0.02%FS±1digit Zero drift : within 0.2mV/℃ RTI Gain drift : within 0.01%/℃
	Analog filter Low pass filter (−6dB/oct.) Select from 10, 30, 100, 300, 1k, 3k, 10k, 30kHz
	A/D converter Rate : 20000times/sec Resolution : 24bit (binary) Approx. 1/30000 against 5V
	Monitor output Output level: 1V output per 1V input (load resistance: 2kΩ or above)
Rotation input	・Pulse input (open-collector) ■high-speed (for standard UTMⅡ/UTMV) Max. frequency Accordance with UTMⅡ/UTMV Min. frequency Select from 15, 10, 5, 3, or 2 rpm (when pulse rate is 4 ppr) 60, 40, 20, 12, 8 rpm (when pulse rate is 1 ppr) Min. pulse width 50μs Circuit configuration:No-voltage contact input (minus common) Open collector connectable (Ic=Approx. 10mA) ■low-speed (for UTMⅡwith rotary encoder option) Max. frequency Approx.1000rpm Min. frequency 0.1rpm Min. pulse width 5μs Circuit configuration:No-voltage contact input (minus common) Open collector connectable (Ic=Approx. 10mA)
Display	Display unit 3.5 inch TFT color LCD
External I/O signal	External output (8) ex) high and low limit outputs
	External input (10) ex) hold control input, digital zero input(DZ)
Interface	SIF : 2-wire serial interface USB : USB interface D3V : D/A converter voltage output (3ch) (Option)
Power supply	DC24V (±15%)
Power consumption	6W typ
Operating conditions	Temperature : Operation −10℃ ～ +40℃ Storage −40℃～ +80℃ Humidity : 85%RH or below (non-condensing)
Dimension	96(W)× 96(H)× 138(D)mm (excluding projections)
Weight	Approx.1.0kg
Attachment	Operation manual……1、External input/output connector……1、 Cable for connecting UTMⅡ/UTMV (2m)……1
Accessories	DTC2 : Case for TM700 (with AC power supply) CA372-I/O: Cable with FCN connector at one-end 3m CA81-USB: miniUSB-computer USB cable 1.8m CATM21-M: Cable for connecting UTMⅡ/UTMV 2m CATM51-M: Cable for connecting UTMⅡ/UTMV 5m CATM(R)21: Cable for UTMⅡwith rotary encoder connection (non-connector at one end)UTMⅡ 2m CATM(R)21-M: Cable for connecting UTMⅡrotary encoder 2m CATM(R)51-M: Cable for connecting UTMⅡrotary encoder 5m CN50: FCN series I/O connector (with cover) CN55: FCN series I/O connector (with diagonal cover) CN90 : Waterproof plastic connector for UTMⅡ/UTMV CN91 : Waterproof plastic connector for UTMⅡrotary encoder GMP96x96 : Rubber seal
CE marking certification	・EMC directives : EN61326-1 : 2013

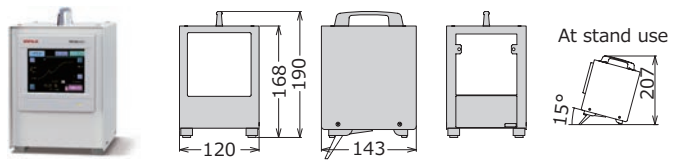
* Power (W) = 2π × Torque (Nm) × Rotation speed (rpm) / 60



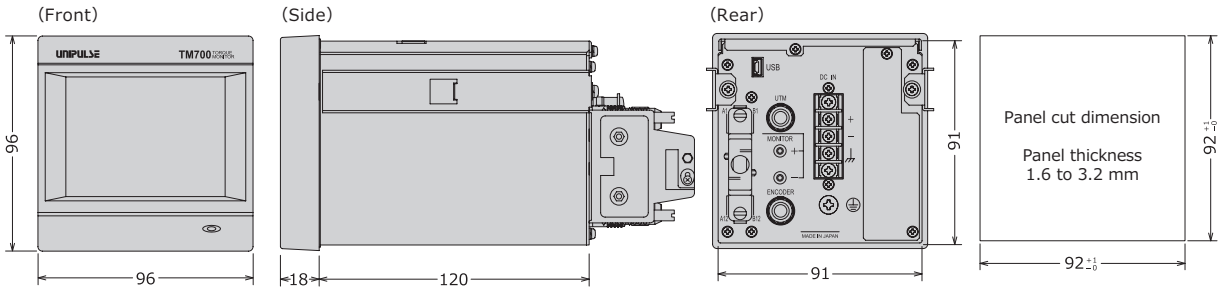
PC Software

PC software for importing parameter settings and screenshots of the display/waveform data from TM700 can be downloaded from our website.

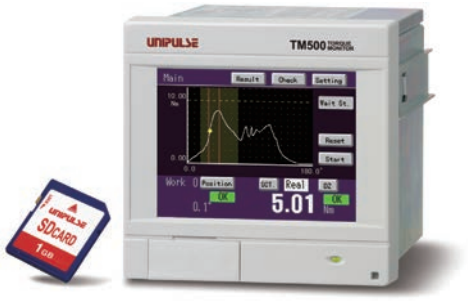
■ Special case DTC2



Dimension



TM500 Torque monitor - torque & angle (or length) measurement, ideal for UTMⅡ with the rotary encoder

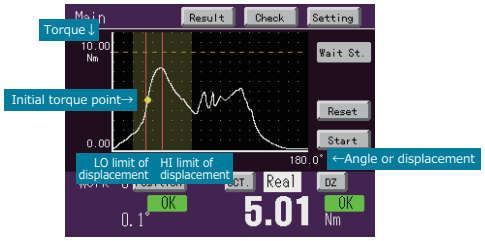


CE RoHS PULSE IN SD CARD PC SOFT CASE

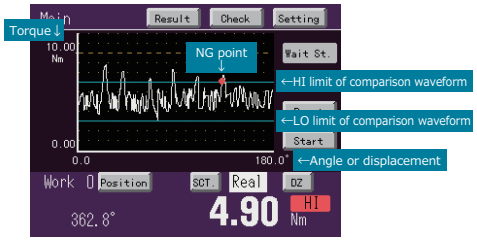
- Torque monitor for UTMⅡ/UTMV.
- Suitable for low-speed rotation and linear motion applications.
- Data are recorded on SD cards.
- Easy connection to UTMⅡ/UTMV with one cable.
- The unit supplies electric power to UTMⅡ/UTMV(also to an optional rotary encoder).

Analog	Torque input	−5 to +5V Input impedance : 1MΩ or more
	Accuracy	Non-linearity : Within 0.02%FS±1digit Zero drift : Within 0.2mV/℃ RTI Gain drift : Within 0.01%/℃
	Analog filter	Low pass filter (−6dB/oct.) Select from 30, 100, 300, 1kHz
	A/D converter	Rate : 4000times/sec Resolution : 24bit (binary) Approx. 1/30000 with respect to 5V
	Monitor output	Output level : Input voltage cuff (For test point)
	Pulse input (Open collector)	Maximum input frequency 50kHz Internal counting range Approx. 1000000
Display	Display unit	3.5 inch TFT color LCD
External I/O signal	External output (15)	Hold result(Load, DPM)／Overload ／Wave result ／Complete ／RUN ／Load OK ／DPM OK ／SD OK
	External input (12)	Load Digital Zero ／DPM Positioning ／Start ／Stop ／Hold ／Reset ／Backlight On ／Prohibit Touch Panel ／Work change
Interface	RS-232C	
Option	SDC : SD card slot (Approx. 80 waveforms can be preserved by 1MB., SDHC and SDXC are not supported.) All indicated values and all comparison waveforms can be saved and restored. Measured waveforms and judgment points can be saved automatically.	
General performance	Power supply	DC24V(±15%)
	Power consumption	7W typ
	Operating conditions	Temperature : Operation −10℃ to +40℃ Storage −20℃ to +60℃ Humidity : 85%RH or less (non-condensing)
	Dimension	96(W)×96(H)×117.3(D)mm(Projections excluded)
	Weight	Approx. 1.0kg
Attachment	Operation manual···1, External input/output connector···1, Cable for connecting UTMⅡ/UTMV 2m···1, Cable for connecting UTMⅡ rotary encoder 2m···1, SD card (1GB)(with SDC option)···1	
Accessories	DTC1 : Case for TM500 (with AC power supply) SD1G : 1GByte card SD2G : 2GByte card SD-ADP : SD card adapter (ATA TYPEⅡ) CA81-232X : miniDIN-D-Sub9p cross cable 1.5m CATM21-M: Cable for connecting UTMⅡ/UTMV 2m CATM51-M: Cable for connecting UTMⅡ/UTMV 5m CATM(R)21: Cable for UTMⅡ with rotary encoder connection (non-connector at one end) 2m CATM(R)21-M: Cable for connecting UTMⅡ rotary encoder 2m CATM(R)51-M: Cable for connecting UTMⅡ rotary encoder 5m CN52 : FCN series I/O connector (with cover) CN57 : FCN series I/O connector (with diagonal cover) CN60 : Circular DIN 8p connector for RS-232C CN90 : Waterproof plastic connector for UTMⅡ/UTMV CN91 : Waterproof plastic connector for UTMⅡ rotary encoder GMP96x96 : Rubber seal	
CE marking certification	・EMC directives : EN61326-1 : 2013	

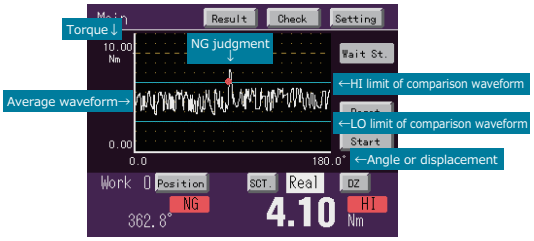
- Upper/lower limit of displacement against a threshold torque can be compared



- Multi-turn inspection is available



・Continuous mode
Inspection can be done in a multi-turn application within 500 turns.

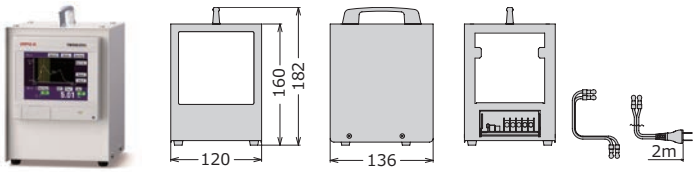


・Average mode
NG recognition is done for an average value of n points data.

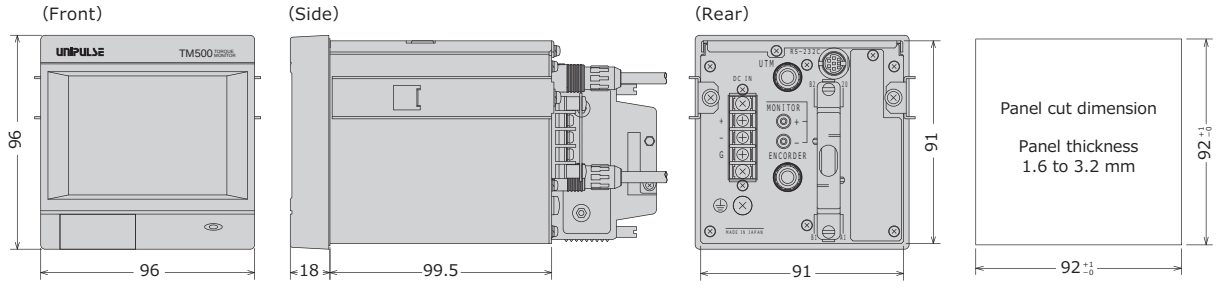
PC Software

・SD card : conversion of saved data into CSV format, parameter settings (save and edit), and conversion of waveform/curve data into CSV format.
・RS-232C : For saving/editing parameter settings and importing waveforms/curves.
※ PC software with above features can be downloaded from our website.

■ Special case DTC1



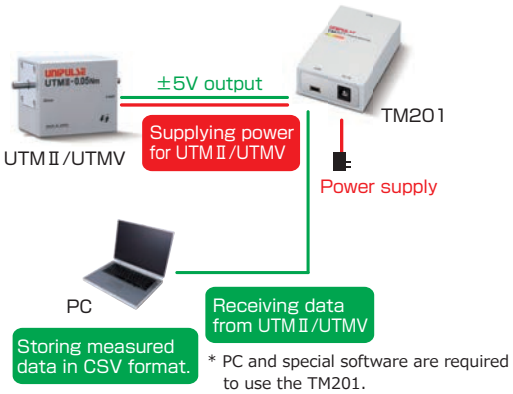
Dimension



TM201　USB interfacing unit - ideal for R&D and laboratory testing, save data on PC easily

- Variations of torque, rpm, and power can be monitored and saved on PC. (Application software for the USB interface option is available.)
- Maximum, minimum, and average value can be displayed.
- Measurement (numeric) data is automatically saved in CSV format.
- The unit supplies electric power to UTMⅡ/UTMV.
- Two cables are attached: one for UTMⅡ/UTMV and the other for PC.

* Power（W） = 2π × Torque（Nm） × Rotation speed（rpm） / 60



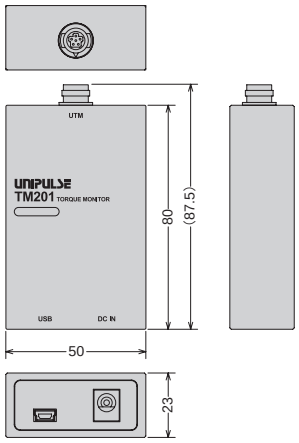
* PC and special software are required to use the TM201.

UTMⅡ Interface	・Torque sensor input (voltage input) Signal input range　−5 to +5V　input impedance : 1MΩ or more Accuracy　Non-linearity : Within 0.02%FS±1digit Zero drift : Within 0.2mV/℃ RTI Gain drift : Within 0.01%/℃ Analog filter　Primary low-pass filter　1kHz (fixed) Digital filter　Secondary low-pass filter　fc = 3, 30, 300, OFF（variable） Data output rate　300 times/sec. Resolution : 24bit（binary） Approx. 1/30000 with respect to 5V	
	・Pulse input for rpm (input for open collector type) Maximum input frequency: Compatible with the pulse output frequency of UTMⅡ/UTMV series Minimum input frequency: Select from 15, 10, 5, 3, or 2 rpm (when pulse rate is 4 ppr) 60, 40, 20, 12, 8 rpm (when pulse rate is 1 ppr) Minimum pulse width: 50μs Circuit layout　No-voltage (dry) contact input (minus common): open collector outputs can be connected (Ic= approx. 10mA)	
	・Power supply for UTMⅡ Power supply　DC24V（UTMⅡ/UTMV 1 unit）	
Display	LED status light	LED（Red）: power supply/alarm status LED（Green）: UTMⅡ/UTMV is operating normally
Interface	USB	
General performance	Power supply	AC100V to 240V（+10%−15%）(free power source 50/60Hz) *When supplied AC adapter is used
	Power consumption	4W typ（AC adapter）
	Operating conditions	Temperature : Operation　0℃ to +40℃　Storage　−10℃ to +60℃ Humidity : 80%RH or less (non-condensing)
	Dimension	50(W)× 80(H)× 23(D)mm（Projections excluded）
	Weight	Approx. 120g
Attachment	Setup guide……1 AC adapter for TM201 1.8m……1	Cable for connecting UTMⅡ/UTMV 2m……1 MiniUSB -USB cable 1.8m……1
Accessories	CA81-USB:miniUSB-computer USB cable 1.8m　CATM21-M:Cable for connecting UTMⅡ/UTMV 2m CATM51-M:Cable for connecting UTMⅡ/UTMV 5m　CN90:Waterproof plastic connector for UTMⅡ/UTMV	
CE marking certification	・EMC directives : EN61326-1 : 2013　・Safety standard : EN62311 : 2008 Please specify requirement for CE marking certified product when making your order.	

PC Software

PC software for parameter settings, graph display, and calibration of TM201 can be downloaded from our website.

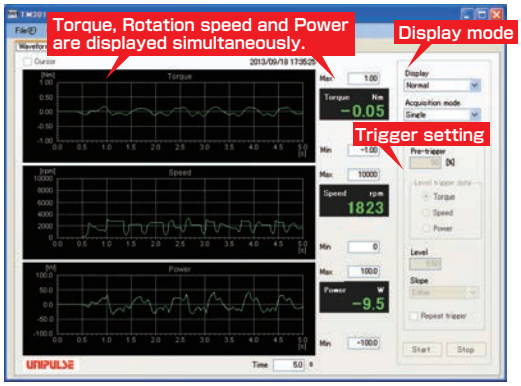
Dimension



Application software

- Support USB interface option for TM201, TM400, TM700, and TM301.
- Enabling real-time display of torque measured by UTMⅡ/UTMV, parameter settings, calibration, and data recording in CSV format.

Example: PC software for TM301



■ Display mode

<Normal>
1. Single
After "start" button is pressed, data will be recorded once for pre-set time period.

2. Continuous
"Single" mode operation will be repeated in cycle until "stop" button is pressed.

3. Hold trigger (only with the TM301)
After "start" button is pressed, it will be put on standby for a trigger ("hold").
It will start importing data when "Hold" button is pressed.
※Pritrigger setting range: 0 to 99%

4. Level trigger
After "start" button is pressed, it will be put on standby for a trigger (variable conditions).
It will start importing data when the input level goes above or below the pre-set limit in pre-determined direction.

<History>
Display saved graph data

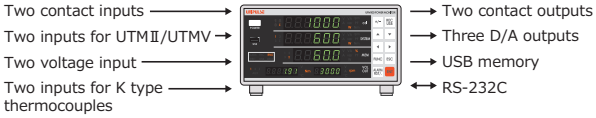
■Trigger function
Pre-trigger/trigger slope/repeating trigger

UPM100 Power and energy monitor

Easy to set up and operate - energy conversion efficiency can be monitored at a glance!

■ Record 1000 measured data of electric power and mechanical power and transfer the data to USB flash drive.
＜Recorded Data＞
Date & time, voltage (between each line), current (each line), electric power (effective, ineffective, apparent), torque, rotation speed, mechanical power, efficiency, power factor, assigned number, and recorded condition.

■ High-speed sampling & wide variety of I/O for various applications.

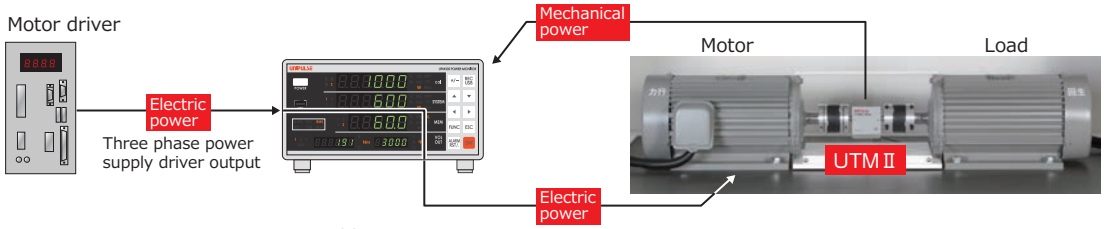


・High-speed sampling rate at 30kS/s (10S/s for thermocouples)
・10 arithmetic processing per second

■ Alarm recording function
Automatically save voltage, current, and electric power of each phase, torque, and rotation speed for 7 seconds before and 3 seconds after alarm turns ON in the internal memory.

Analog	・Electric power measurement	
	Supply system	1P2W(single phase two wires), 3P3W (three phase three wires)
	Input	Voltage:resistance voltage division, Current:DCCT
	Measurement range	Voltage:AC400Vrms (CF=1.5, peak =600V) Current:15Arms (CF=3, peak = 45A) Wattage:9999W
	Frequency range	10 to 600Hz (DC or less than 10Hz: average value for 0.1 second / Over 10Hz: display "RMS" or "MEAN")
	Accuracy	Voltage:0.5%FS 0.05%/℃ Current:1%FS 0.1%/℃ Electricity:1.5%FS 0.15%/℃ (for DC or 10 - 300Hz)
	Measurement range	Voltage:400Vrms, Current:15Arms
	Sampling speed	30kSPS
	Analogue filter	480 kHz primary low-pass filter (-6dB/oct)
	・Arithmetic calculation	
	Voltage calculation	effective value (RMS) / average rectified effective value / arithmetic average Voltage:1P2W measured point / 3P3W voltage between each phase and the sum
	Current calculation	effective value current:1P2W measured point / 3P3W current of each phase and the sum
	Electric power calculation	effective power / apparent power / ineffective power / power factor Effective power: 1P2W measured point / 3P3W the sum Apparent power: 1P2W measured point / 3P3W the sum Ineffective power: 1P2W measured point / 3P3W the sum Power factor: 1P2W measured point / 3P3W the sum
	・Torque input (Voltage)	
	Signal input range	-5 to +5V / input impedance:1MΩ or more
	Accuracy	Non-linearity:within 0.02%/FS ±1digit Zero drift:within 0.2mV/℃ RTI Gain drift:within 0.01%/℃
	Analog filter	primary low-pass filter (-6dB/oct.) 6kHz
	A/D converter	speed:30000times/sec arithmetic processing speed:1000times/sec resolution:14bit(binary) 1/10000 of full-scale
	・Pulse input(open-collector)	
	Max. input frequency	In accordance with the output frequency of the UTMⅡ/UTMV series
	Min. input frequency	Select from 15, 10, 5, 3, or 2 rpm (when pulse rate is 4 ppr) 60, 40, 20, 12, 8 rpm (when pulse rate is 1 ppr)
	Circuit configuration	No-voltage contact input (minus common) Open collector can be connected (Ic=Approx. 10mA)
	・Two voltage input: AUX1 and AUX2	
	Signal input range	±5V (over range: 6V)
	A/D converter	speed:30000times/sec arithmetic processing speed:1000times/sec refresh speed:10times/sec
	・2 thermocouple inputs: K type	
	Temperature range:−200 ～+1300℃, refresh speed:10times/sec, accuracy:1%FS	
Display	Display unit	
	Main display	Upper and middle display: 15mm character heights, 7-segments green LED, 6 digits numeric display Lower display: 15mm character heights (7-segments green LED, 5 digits numeric display
	Sub display	Left: 8mm character height, 7-segments, green LED , 6 digits numeric display Right: 8mm character height, 7-segments, green LED, 5 digits numeric display
	Status lamp	ALARM, FNC, RMS, REC, USB, MEAN (red LED) 1, 2, 3, Σ, AUX (orange LED) V, A, VA, var, W, rpm, PF, Nm, %, ℃(orange LED)
	Frequency	10PPS or 2PPS (selectable)
	Digital filter	OFF, 2, 4, 8, or 16 times (selectable)
External signal	Input signals(2)	TRG1 ／ TRG2
	Output signals(2)	ALARM1 ／ ALARM2
Interface	232: RS-232C communication interface DAV: D/A converter, voltage outputs (torque, rotation speed, and power) USB: USB memory: USB memory interface	
General specifications	Power supply	AC100 to 240V(+10%−15%) (free power source 50/60Hz)
	Power consumption	15W typ (AC adopter)
	Operating conditions	Temperature:Operation: −10 to +40℃ Storage: −40 to +80℃ Humidity:85%RH or less (non-condensing)
	External dimensions	220(W)×110(H)×160(D)mm(Projections excluded)
	Weight	approx. 2.0kg
Attachment	AC adopter(1.8m).....1 Cable for UTMⅡ/UTMV connection(2m).....2 Operation manual.....1	

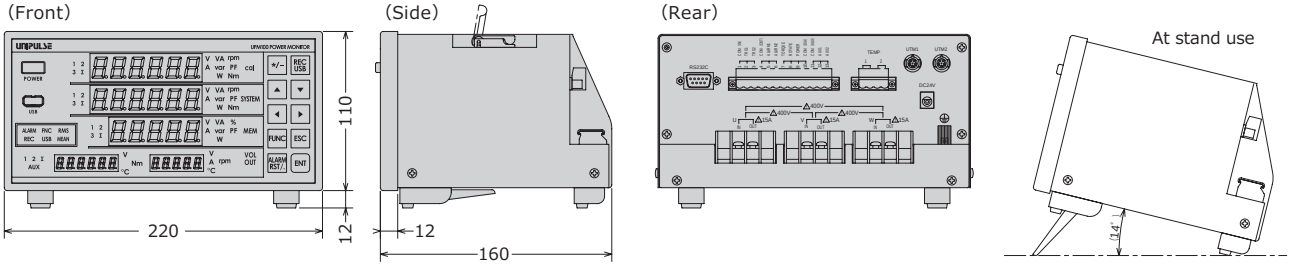
Example system configuration



UPM100

Monitoring energy conversion efficiency of motor:
[mechanical power]÷[electric power] x 100% and enabling measurement of voltage, current, power factor, torque, rotation speed, and combined efficiency of inverters and motors!

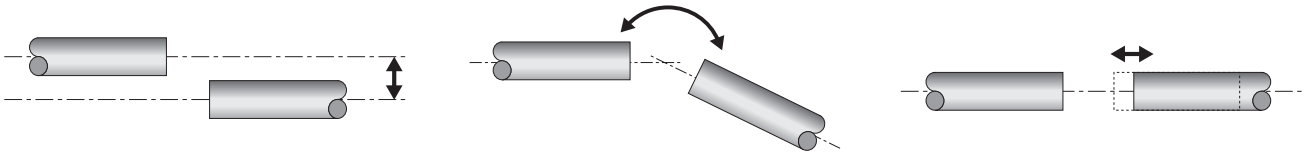
Dimension



Coupling

What' s coupling?

UTMⅡ/UTMV adopts strain gauges for measuring torsional strain on the shaft. The shaft is designed to withstand any disturbing stress induced by radial or thrust forces. However, radial/thrust overloads will not only result in measurement error but also heating-up of the bearings and/or irreversible distortion or fracture of UTMⅡ/UTMV. Typical misalignments, radial misalignment, angular misalignment, and endplay are shown in the figure below. Remaining misalignments between the UTMⅡ/UTMV shaft and drive/load shafts induce radial and thrust forces. Hence couplings are required to absorb these disturbing forces and improve smoothness of rotating and accuracy. Allowance levels of the misalignments are dependent on the combination of the range of UTMⅡ/UTMV and couplings; thus fine adjustment will be needed for actual usage.



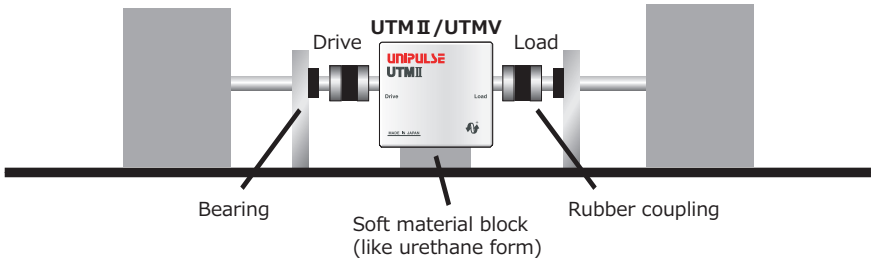
Radial misalignment　　Angular misalignment　　Endplay

Recommended coupling

We strongly recommend rubber couplings shown in the right-hand side photograph (Correspondent couplings are indicated by ● in the following table). Rubber coupling is composed of two rigid parts connected to the axes with rubber joining the two parts.
No backlash, well rotation balance and excellent damping of vibration are the features of rubber coupling, and thus they are the most suitable couplings for UTMⅡ/UTMV. If you can not choose rubber couplings, please select single disk couplings. If you use multiple double disk couplings or slit type couplings on the axis, unexpected vibration may occur because UTMⅡ/UTMV is suspended by springs. Unexpected vibration reduces accuracy and results in damage on UTMⅡ/UTMV in the worst case.

How to use couplings

UTMⅡ/UTMV shafts are connected to drive-side and load-side shafts with rubber couplings as shown in the below. If the load and driving devices have bearing internally, the bearings in the figure are unnecessary.
A soft block made of urethane and on should be put between main frame of UTMⅡ/UTMV and base (to hold the main frame of UTMⅡ/UTMV loosely).



Please minimize the torque fluctuation synchronized to rotation and adjust the misalignments carefully.

Warning in high rotating speed

In case UTMⅡ/UTMV is used at a high rotational speed, dynamic balance needs to be adjusted in addition to alignments. If shaft is unbalanced, vibration will be caused at high rotational speed due to resonance, which, in turn will damage UTMⅡ/UTMV and couplings. Please adjust the balance carefully, increasing the rotational speed gradually. Key groove option is not recommended if UTMⅡ/UTMV is used at high rotational speed.

Prohibition

- Do not use Oldham coupling. UTMⅡ/UTMV will come off the original position, and UTMⅡ/UTMV or other devices will be damaged.
- Do not use double disk coupling or slit type coupling. In case a slit type or double disc type coupling is used on one end of shaft, please mount and fix the body of UTMⅡ/UTMV on a fixture or stand. Otherwise, resonant vibration may occur, which, in turn, may cause overload and damages on UTMⅡ/UTMV.

Coupling correspondence table

Recommended couplings are indicated in the below table.
Consult one of our sales representatives for couplings for the UTMⅡ-10000Nm and key groove option.

Supported UTMⅡ/UTMV	UTMⅡ/UTMV dia. (mm)	Coupling type	Max. torque (Nm)	Coupling dia. (mm)																																				
				3	4	5	6	8	10	11	12	14	15	16	18	19	20	22	24	25	28	30	32	35	38	40	42	45	48	50	55	60	65	70	75	80	85	90
UTMⅡ-0.05Nm UTMⅡ-0.1Nm UTMV-0.1Nm UTMⅡ-0.2Nm	5	UCM15	2.2	●	●	●	●																																	
		UCS15	1	●	●	●	●																																	
		UCM19	4.2		●	●	●	●																																
		UCS19	1.6		●	●	●	●																																
		UCM25	8					●	●	●	●																													
		UCS25	4.6					●	●	●	●																													
				3	4	5	6	8	10	11	12	14	15	16	18	19	20	22	24	25	28	30	32	35	38	40	42	45	48	50	55	60	65	70	75	80	85	90
UTMⅡ-0.5Nm UTMV-0.5Nm UTMⅡ-1Nm UTMV-1Nm UTMⅡ-2Nm	8	UCM19	4.2		●	●	●	●																															
		UCM25	8			●	●	●	●	●	●																													
		UCS25	4.6			●	●	●	●	●	●																													
		UCM30	12.6					●	●	●	●	●	●																											
		UCS30	6.6					●	●	●	●	●	●																											
		UCM34	16					●	●	●	●	●	●	●																										
		UCS34	11					●	●	●	●	●	●	●																										
		UCM39	27											●	●	●	●																						
		UCS39	14											●	●	●	●																						
		UCM44	36											●	●	●	●	●																					
				3	4	5	6	8	10	11	12	14	15	16	18	19	20	22	24	25	28	30	32	35	38	40	42	45	48	50	55	60	65	70	75	80	85	90
UTMⅡ-5Nm UTMV-5Nm UTMⅡ-10Nm UTMV-10Nm	12	UCM30	12.6						●	●	●	●	●																										
		UCM34	16						●	●	●	●	●																										
		UCS34	11						●	●	●	●	●																										
		UCM39	27						●		●	●	●	●		●	●																						
		UCS39	14						●		●	●	●	●		●	●																						
		UCM44	36								●	●		●		●																						
		UCM56	70								●	●	●	●	●	●																						
		UCM65	80															○	○	○	○	○	○	○														
				3	4	5	6	8	10	11	12	14	15	16	18	19	20	22	24	25	28	30	32	35	38	40	42	45	48	50	55	60	65	70	75	80	85	90
UTMⅡ-20Nm	20	UCM44	36										●	●	●	●	●	●																				
		UCM56	70													●	●	●	●	●	●																	
		UCM65	80															○	○	○	○	○	○	○														
				3	4	5	6	8	10	11	12	14	15	16	18	19	20	22	24	25	28	30	32	35	38	40	42	45	48	50	55	60	65	70	75	80	85	90
UTMⅡ-50Nm UTMV-50Nm	20	UCM56	70													●	●	●	●	●	●																	
		UCM65	80															○	○	○	○	○	○	○														
				3	4	5	6	8	10	11	12	14	15	16	18	19	20	22	24	25	28	30	32	35	38	40	42	45	48	50	55	60	65	70	75	80	85	90
UTMⅡ-100Nm UTMV-100Nm	25	UCM87	250														○	○	○	○	○	○	○	○	○	○	○	○										
				3	4	5	6	8	10	11	12	14	15	16	18	19	20	22	24	25	28	30	32	35	38	40	42	45	48	50	55	60	65	70	75	80	85	90
UTMⅡ-200Nm	30	UCM87	250															○	○	○	○	○	○	○	○	○	○											
				3	4	5	6	8	10	11	12	14	15	16	18	19	20	22	24	25	28	30	32	35	38	40	42	45	48	50	55	60	65	70	75	80	85	90
UTMⅡ-500Nm UTMV-500Nm	40	UCM150	1000																			○	○	○	○	○	○	○	○	○								
		UCM170	1300																												○	○						
				3	4	5	6	8	10	11	12	14	15	16	18	19	20	22	24	25	28	30	32	35	38	40	42	45	48	50	55	60	65	70	75	80	85	90
UTMⅡ-1000Nm UTMV-1000Nm	60	UCM170	1300																							○	○	○	○	○	○	○						
		UCM220	4800																														○					
				3	4	5	6	8	10	11	12	14	15	16	18	19	20	22	24	25	28	30	32	35	38	40	42	45	48	50	55	60	65	70	75	80	85	90
UTMⅡ-2000Nm	70	UCM220	4800																											○	○	○	○	○				
		UCM260	6880																																○	○		
				3	4	5	6	8	10	11	12	14	15	16	18	19	20	22	24	25	28	30	32	35	38	40	42	45	48	50	55	60	65	70	75	80	85	90
UTMⅡ-5000Nm UTMV-5000Nm	90	UCM260	6880																																	○	○	○

● : Recommended rubber coupling

Specification

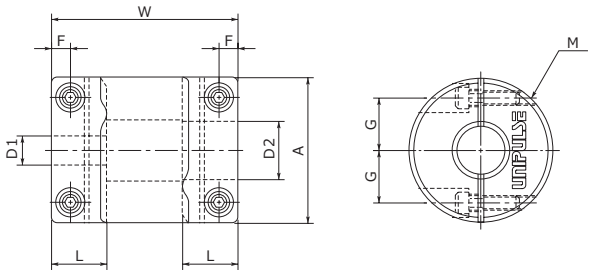
Type	Max. diameter (mm)	Max. torque (Nm)	Max. speed (rpm)	Inertia moment (kgm^2)	Torsional rigidity (Nm/rad)	Allowable eccentricity (mm)	Allowable deflection angle (°)	Allowable endplay (mm)	Weight (g)
UCM15	6	2.2	42000	2.7×10^{-7}	43	0.15	1.5	± 0.2	8
UCS15		1		2.0×10^{-7}	25				7
UCM19	8	4.2	33000	8.4×10^{-7}	88	0.15	1.5	± 0.2	14
UCS19		1.6		6.2×10^{-7}	63				12
UCM25	12	8	25000	3.0×10^{-6}	170	0.15	1.5	± 0.2	28
UCS25		4.6		2.3×10^{-6}	125				25
UCM30	15	12.6	21000	6.9×10^{-6}	220	0.20	1.5	± 0.3	45
UCS30		6.6		5.5×10^{-6}	160				39
UCM34	16	16	18000	1.3×10^{-5}	390	0.20	1.5	± 0.3	65
UCS34		11		1.0×10^{-5}	350				62
UCM39	20	27	16000	2.7×10^{-5}	520	0.20	1.5	± 0.3	98
UCS39		14		2.1×10^{-5}	440				85
UCM44	22	36	14000	4.2×10^{-5}	640	0.20	1.5	± 0.3	136
UCM56	28	70	11000	1.4×10^{-4}	1500	0.20	1.5	± 0.3	276

Type	Max. diameter (mm)	Max. torque (Nm)	Max. speed (rpm)	Inertia moment (kgm^2)	Torsional rigidity (Nm/rad)	Axial spring constant (N/mm)	Allowable deflection angle (°)	Allowable endplay (mm)	Weight (kg)
UCM65	35	80	8000	4.53×10^{-4}	53900	392	0.6	± 0.3	0.7
UCM87	45	250	6000	1.68×10^{-3}	147000	343	0.6	± 0.5	1.6

Type	Max. diameter (mm)	Max. torque (Nm)	Max. speed (rpm)	Inertia moment (kgm^2)	Torsional rigidity (Nm/rad)	Axial spring constant (N/mm)	Allowable deflection angle (°)	Allowable endplay (mm)	Weight (kg)
UCM150	60	1000	5900	14.07×10^{-3}	1500000	244	1	± 0.4	6.43
UCM170	60	1300	5100	28.98×10^{-3}	2840000	224	1	± 0.5	9.19
UCM220	70	4800	4000	112.34×10^{-3}	5940000	448	1	± 0.6	23.5
UCM260	90	6880	3400	248.75×10^{-3}	10780000	612	1	± 0.7	35.3

Dimension

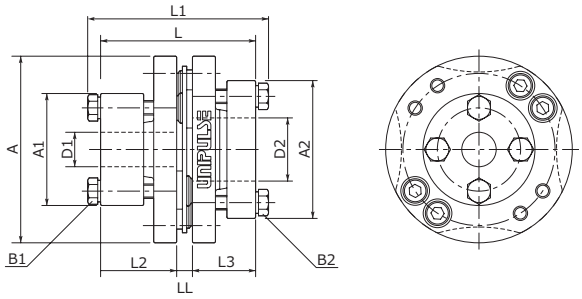
■ UCM15 to 56 ■ UCS15 to 39



Corresponding measurement range of UTM Ⅱ/UTMV (Nm)	Type	A	L	W	F	G	M	D1*D2	Screw tightening torque (Nm)
0.05, 0.1, 0.2	UCM15	15	6.5	23	2.15	5	M1.6	3*5, 4*5, 5*5, 5*6	0.25
	UCS15			18					
0.05, 0.1, 0.2, 0.5, 1, 2	UCM19	19	7.7	26	2.65	6.5	M2	4*5, 4*8, 5*5, 5*6, 5*8, 6*8, 8*8	0.5
0.05, 0.1, 0.2	UCS19			20				4*5, 5*5, 5*6, 5*8	
0.05, 0.1, 0.2, 0.5, 1, 2	UCM25	25	9.5	32	3.25	9	M2.5	5*8, 5*10, 5*11, 5*12, 6*8, 8*8, 8*10, 8*11, 8*12	1
	UCS25			27					
0.5, 1, 2, 5, 10	UCM30	30	11	36	4	11	M3	8*8, 8*10, 8*11, 8*12, 8*14, 8*15, 10*12, 11*12, 12*12, 12*14, 12*15	1.5
0.5, 1, 2	UCS30			30				8*8, 8*10, 8*11, 8*12, 8*14, 8*15	
0.5, 1, 2, 5, 10	UCM34	34	12	38	4	12.25	M3	8*8, 8*10, 8*11, 8*12, 8*14, 8*15, 8*16, 10*12, 11*12, 12*12, 12*14, 12*15	1.5
	UCS34			35					
	UCM39	39	15.5	48	4.5	14.5	M4	8*16, 8*18, 8*19, 8*20, 10*12, 12*12, 12*14, 12*15, 12*16, 12*19, 12*20	2.5
	UCS39			40					
0.5, 1, 2, 5, 10, 20	UCM44	44	15	48	4.75	16	M4	8*16, 8*18, 8*19, 8*20, 8*22, 12*12, 12*14, 12*16, 12*19, 15*20, 16*20, 18*20, 19*20, 20*20, 20*22	2.5
5, 10, 20,50	UCM56	56	19.5	60	5.5	20	M5	12*12, 12*14, 12*15, 12*16, 12*18, 12*19, 12*20, 19*20, 20*20, 20*22, 20*24, 20*25, 20*28	7

Recommended size tolerance of shaft diameter is h6 or h7.

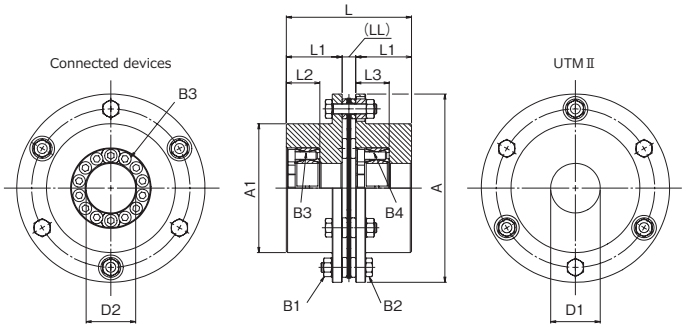
■ UCM65, 87



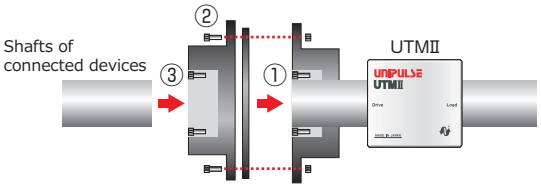
Corresponding measurement range of UTM Ⅱ/UTMV (Nm)	Type	A	A1	A2	L	L1	L2	L3	LL	Size of lock bolt B1	Size of lock bolt B2	D1*D2	Screw tightening torque (Nm)
5, 10, 20, 50	UCM65	65	39	48 53 53 58 58 63 63	54	63	26.5	22	5.5	M5 × 25	M5 × 22	12*22 12*24 12*25 12*28 12*30 12*32 12*35	6
			48	48 53 53 58 58 63 63	49.5	58.5	22			M5 × 22		20*22 20*24 20*25 20*28 20*30 20*32 20*35	
100, 200	UCM87	87	53	62	67	77	30	30	7	M6 × 30	M6 × 30	20*25	13.7
			53	62								22*25	
			62	62 66								24*25 24*30	
			62	62 62 66 66 68 78 78 78 78								25*25 25*28 25*30 25*32 25*35 25*38 25*40 25*42 25*45	
			62	66								28*30	
			66	66 66 68 78 78 78 78								30*30 30*32 30*35 30*38 30*40 30*42 30*45	

Recommended size tolerance of shaft diameter is h6 or h7.

■ UCM150 to 260



■ Installation

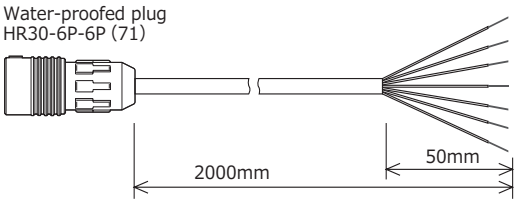


Numbers on figure show the order of fastening bolts of couplings.

Corresponding measurement range of UTM Ⅱ/UTMV (Nm)	Type	A	A1	L	L1	L2	L3	LL	Hexagon nut B1	Reamer bolt B2	Clamping bolt B3	Clamping bolt B4	D1*D2
500	UCM150	152	104	101	45	27	27	11	M8	M8	M6	M6	40*30, 40*32, 40*35, 40*38, 40*40
						33	27				M8	M6	40*42, 40*45, 40*48, 40*50
500, 1000	UCM170	178	118	124	55	33	27	14	M10	M10	M8	M6	40*55, 40*60
						27	33				M6	M8	60*40
						33	33				M8	M8	60*42, 60*45, 60*48, 60*50, 60*55, 60*60
1000, 2000	UCM220	225	144	200	90	33	33	20	M16	M16	M8	M8	60*65
						33	39				M8	M10	70*50, 70*55, 70*60, 70*65
						39	39				M10	M10	70*70
2000, 5000	UCM260	262	166	223	100	39	39	23	M20	M20	M10	M10	70*75, 70*80, 90*80, 90*85, 90*90

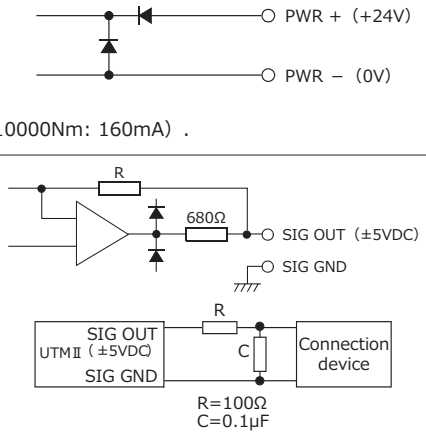
Recommended size tolerance of shaft diameter is h9.

Cable



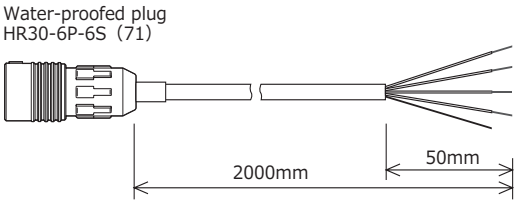
1 : Red PWR+ (+24V)
2 : Black PWR – (0V)
3 : Green SIG OUT (±5VDC)
4 : White SIG GND
5 : Yellow PULSE OUT +
6 : Brown PULSE OUT –
Shield

Class	Pin number	Signal name	Details
Power	1	PWR+ (+ 24V)	Connect to +24V power supply. Voltage range must be within +24V plus-minus 15%. Use a power supply that can stably operate with a small load since the consumption current is 100mA or less (20Nm to 500Nm: 150mA, 1000Nm to 10000Nm: 160mA) .
	2	PWR – (0V)	
Torque signal	3	SIG OUT (± 5V DC)	This is signal output. The signal is adjusted to 0V for no-load and 5V for full scale. The minimum resistant is 2k Ω .
	4	SIG GND	In case of electrically noisy environment, please try to insert RC low-pass filter as below. This is effective to reduce high frequency noises.
Rotating pulse	5	PULSE OUT + (Photocoupler)	Pulse signal output generates 4 pulses per 1 rotation. Rated voltage and current are 30V and 10mA, respectively.
	6	PULSE OUT –	



■ PWR – , SIG GND, and PULSE OUT – are insulated respectively.
■ The housing of UTMⅡ/UTMV is electrically insulated from all electronic circuits.

Rotary encoder cable

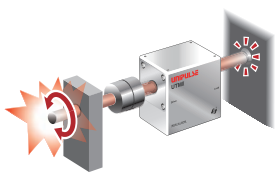


1 : – (NC)
2 : Red PWR+(+5V)
3 : Transparence Z-phase outp
4 : Black B-phase
5 : Blue A-phase
6 : Shield (Green) PWR GND

Precautions

Possibility of overloads during setup

If one side of shaft (either "Drive" or "Load" side) is fixed during setup, excessive torque above rated capacity may be applied to shafts unintentionally. Please pay extra care especially for those types with low rated capacity.



Alteration of shafts

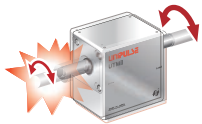
Never make alteration to shafts of UTMⅡ/UTMV (by machining) , as it will affect the accuracy of the sensor.

Protection against water and condensation

UTM Ⅱ /UTMV is not water-resistant, so please take measures to avoid water damage. Also, do not use the product under dew-condensing condition.

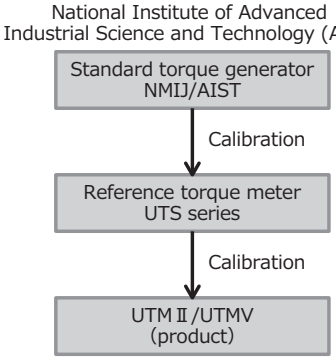
Overload due to resonance vibration

In case UTM Ⅱ /UTMVis used with device causing vibration, overloads may be caused due to resonance vibration.



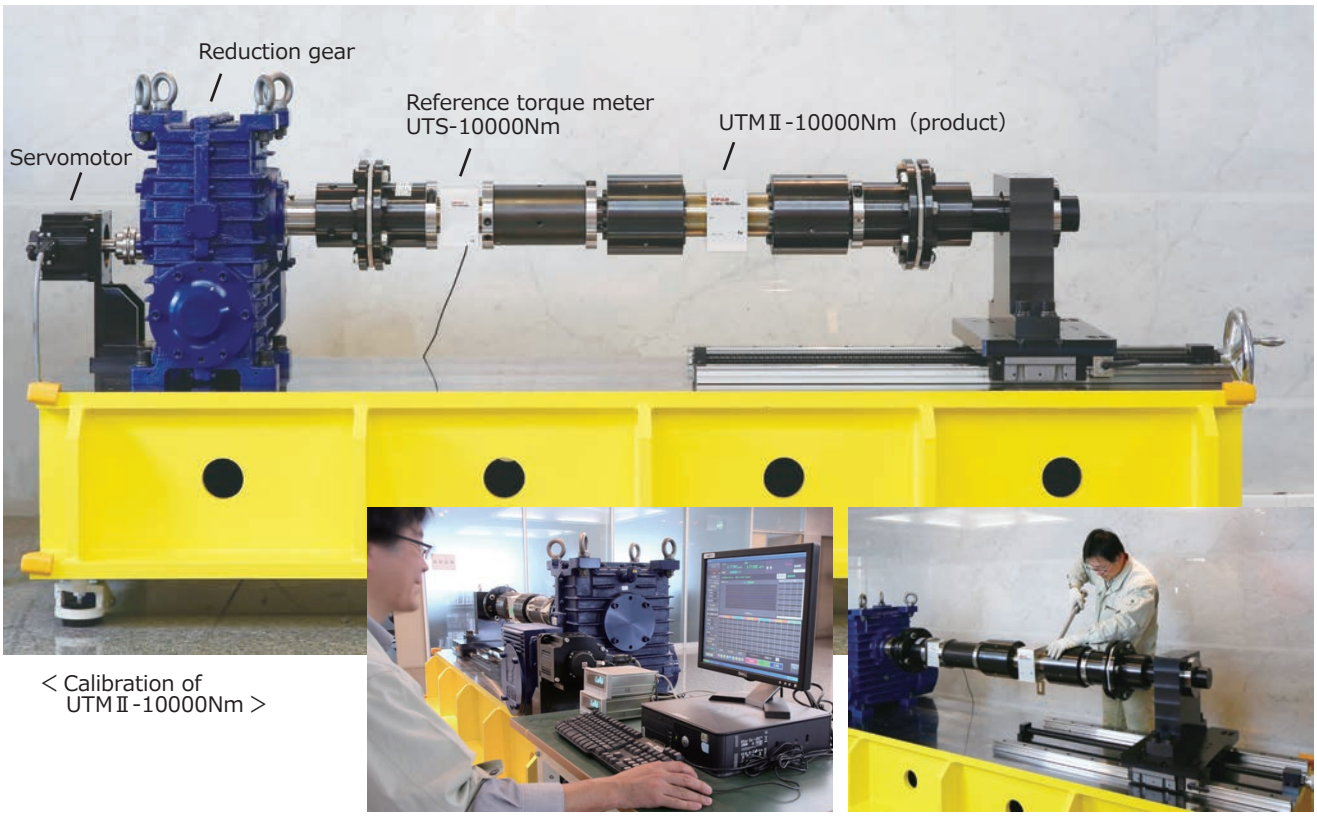
Calibration of UTMⅡ/UTMV

For calibrating torque meter, pure torque must be applied to the torque meter.
The equipments for the calibration are designed to eliminate disturbing force and transmit the pure torque to UTMⅡ/UTMV. Because UTMⅡ and UTMV are available in wide capacity range (0.05-10000Nm for UTMⅡ and 0.1-5000Nm for UTMV), different calibration tools (designed and built in-house) are used for different capacity ranges.
The traceability diagram of UTMⅡ/UTMV is shown on the right. UTS series are non-rotary torque sensors calibrated at AIST with the national standard torque generator, and those are used as calibration masters for calibration of torque meters at our facility. With those UTS series, UTMⅡ and UTMV torque meters (products) are calibrated.



＜Traceability diagram for UTMⅡ/UTMV＞

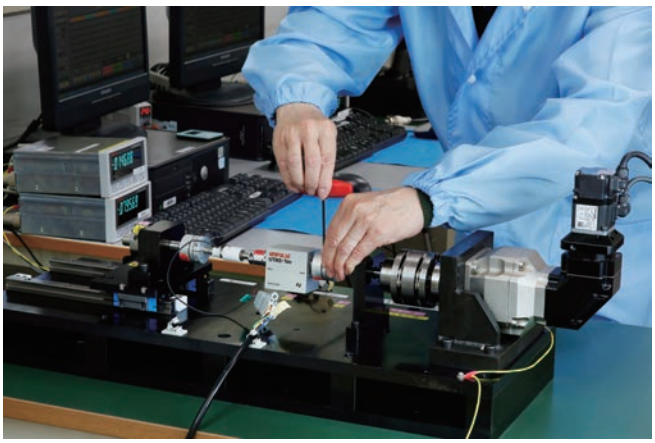
Pictures below show calibration equipment with UTS-10000Nm (calibration master for 10000Nm capacity). A calibrated torque meter and the calibration master (UTS) are directly connected, and the one side of the shaft is fixed. The other side of the shaft is connected to a reduction gear, and a servo motor is used as an actuator to apply torque on the connected shafts. The same torque is applied to the calibration master (UTS) and the calibrated product, and outputs (voltage) from the calibration master and the products are measured and compared for calibration.



＜Calibration of UTMⅡ-10000Nm＞

Depending on capacity, calibration tools like below pictures are also used.

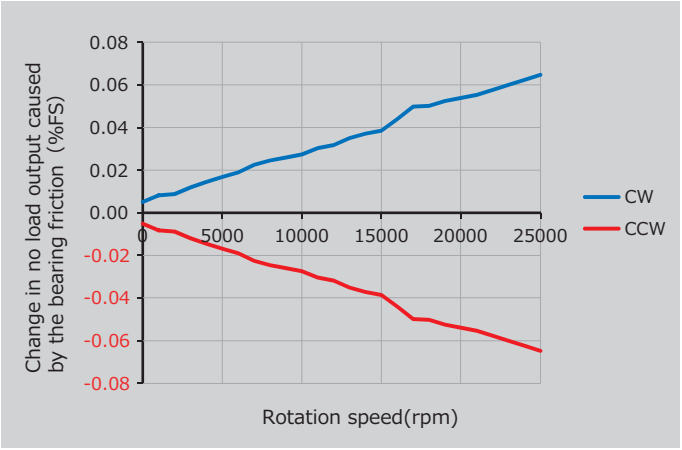

＜Calibration of UTMⅡ-100Nm＞


＜Calibration of UTMⅡ-1Nm＞

Rotational characteristics of UTMⅡ/UTMV

The error at the elevated rotation speed is mainly originated from rotational friction of the bearings and the distortion of the rotating shaft by centrifugal force.

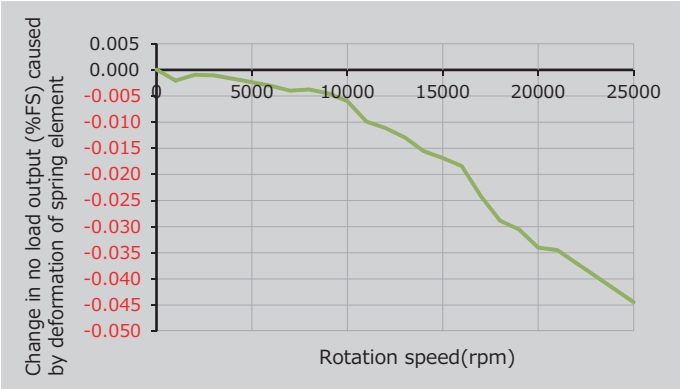
As the rotation speed goes up, the bearing friction also increases like the graph on right. The condition of bearing (installation, frequency of use. , temperature, etc...) also affects the bearing friction.



＜Rotation speed vs. error caused by bearing friction (sample case with UTMⅡ-0.2Nm) ＞

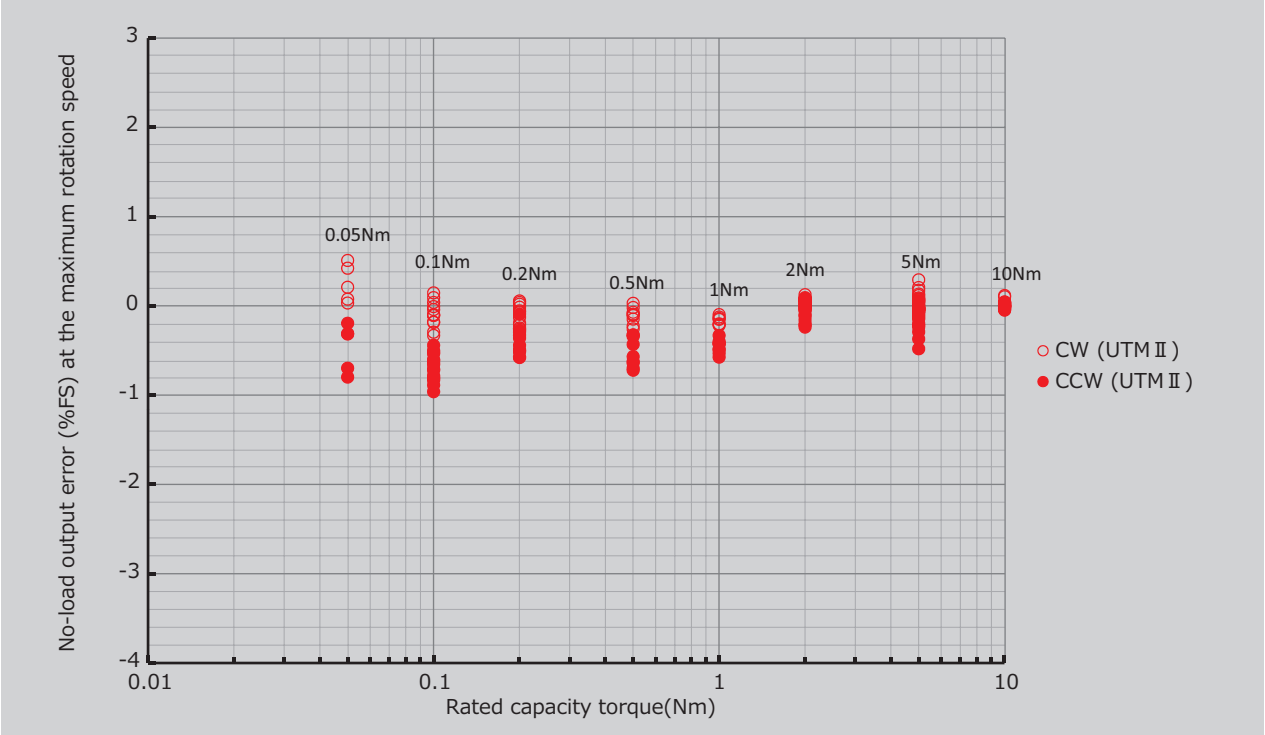
Also, centrifugal force could cause deformation of spring elements, affecting the output like the graph on right. The degree of error is related to rotation speed, and it is reproducible. Degree of change in output caused by deformation of spring element is different for each product depending on how symmetrically strain gauges are mounted on the shaft.

Combination of those contributing factors for errors cause the fluctuation of no-load voltage output corresponding to rotation speed.



＜Rotation speed vs. error caused by centrifugal force (UTMⅡ-0.2Nm) ＞

Graph below shows no-load output errors of 95 pieces of UTMII with capacity ranges from 0.05N to 10Nm at 25000 rpm (for both CW and CCW). Accuracy in voltage output is different for each product, but the maximum error is less than 1% of full scale.

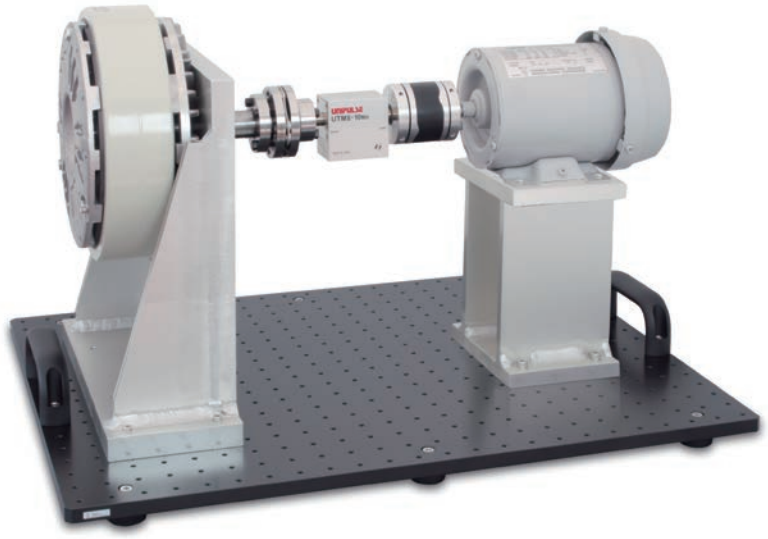


＜No-load output error of UTMⅡ at the maximum rotation speed＞

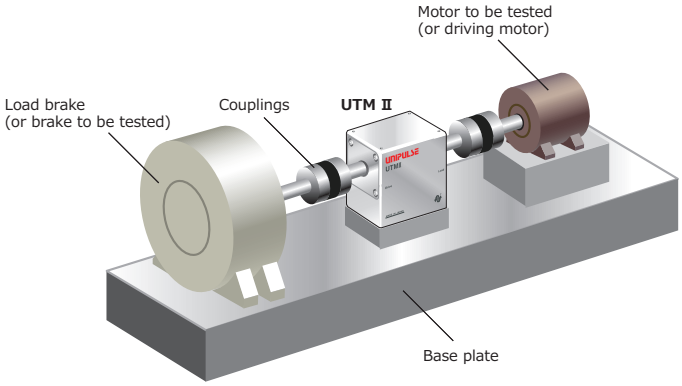
Introduction of test bench

TB series

TB series is a test bench set for motor and/or brakes using UTMⅡ. The set includes torque meter UTMⅡ, and other hardware like a base plate, bearing housing, set of couplings, and so on. We offer best test bench configuration, using UTMⅡ. Please contact our sales division.



A typical configuration example.



Definition of the type

TB-□ □ □

Torque capacity

0.05Nm	R05
0.1Nm	R10
⟩	
1Nm	001
⟩	
10Nm	010
⟩	
100Nm	100
⟩	
1000Nm	01K

- Please let us know the required torque capacity, the maximum rotating speed.
- For brake system, we can offer a hysteresis brake, powder brake, generator, or other, depending on the required load capacity.
- Please note that there could be a limit on rotational speed for a break. Please check the estimated rotational speed before use.
- We can also offer other customized solutions for your purpose and applications. Please consult with our sales representatives for details.

Definitions of technical terms

Word	Definition	Unit
Measurement range	Measurable torque range	Nm
Non-linearity	The maximum difference between ideal and actual outputs in the measurement range	%FS
Hysteresis	The maximum difference between loading and unloading outputs in the measurement range	%FS
Repeatability	he maximum deviation of output in several measurement under same conditions	%FS
Safe Overload	The allowable load keeping accuracy after unloading	%FS
Maximum Safe Overload	Load cells will fail (permanent deformation) if the yield strength is exceeded	%FS
Operation Temperature Range	Temperature range in which UTMⅡ works properly	℃
Temperature Effect on Zero	Temperature coefficient at no-load	%FS/℃
Temperature Effect on Span	Temperature coefficient of the full scale value	%FS/℃
Cut-off Frequency	The frequency at which the sinusoidal signal becomes -3dB (70.7%) against DC signal	Hz
Torsional Constant	The torque for 1 rad torsional angle	Nm/rad
Max. Torsional Angle	The torsional angle when the full scale torque applied to the shaft	rad
Inertia Moment	The coefficient of angular acceleration to torque in the torsional equation of motion	kgm^2
Thrust Direction	The parallel direction to the rotation axis in UTMⅡ	
Radial Direction	Vertical direction to the rotation axis in UTMⅡ	

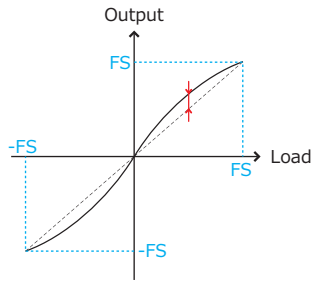
Units

Unit	Description
Nm	A unit of torque. 1 Nm is the torque on the rotation axis when 1N force is applied to the end of 1m arm.
rpm	A unit of rotation speed. Rotation cycles in 1 minute.
rad	A unit of angle. 1 rad equals to approx. 57.2957°.
FS	The maximum value in the measurement range. %FS means % of Full Scale.

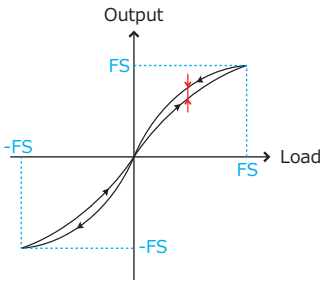
Conversion table of torque units

	Nm	Ncm	kgm	kgcm	gcm	mNm
Nm ⇒	1	10^2	0.10197	10.197	1.0197×10^4	10^3
Ncm ⇒	10^{-2}	1	1.0197×10^{-3}	0.10197	1.0197×10^2	10
kgm ⇒	9.8067	9.8067×10^2	1	10^2	10^5	9.8067×10^3
kgcm ⇒	9.8067×10^{-2}	9.8067	10^{-2}	1	10^3	98.067
gcm ⇒	9.8067×10^{-5}	9.8067×10^{-3}	10^{-5}	10^{-3}	1	9.8067×10^{-2}
mNm ⇒	10^{-3}	0.1	1.0197×10^{-4}	1.0197×10^{-2}	10.197	1

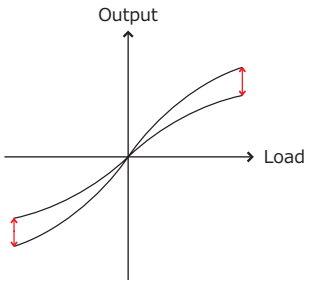
Non-linearity



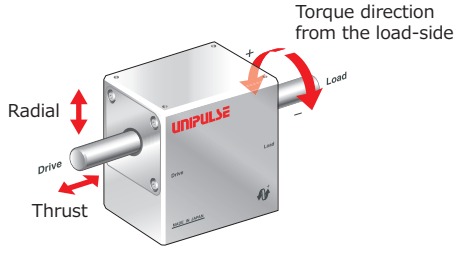
Hysteresis



Repeatability



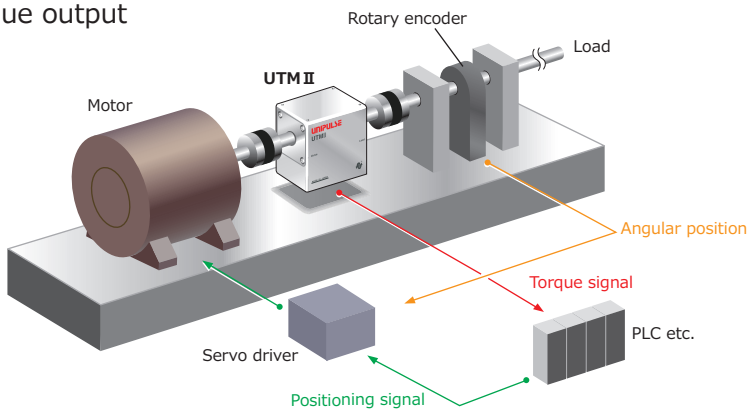
Thrust direction, radial direction and torque direction



Application examples

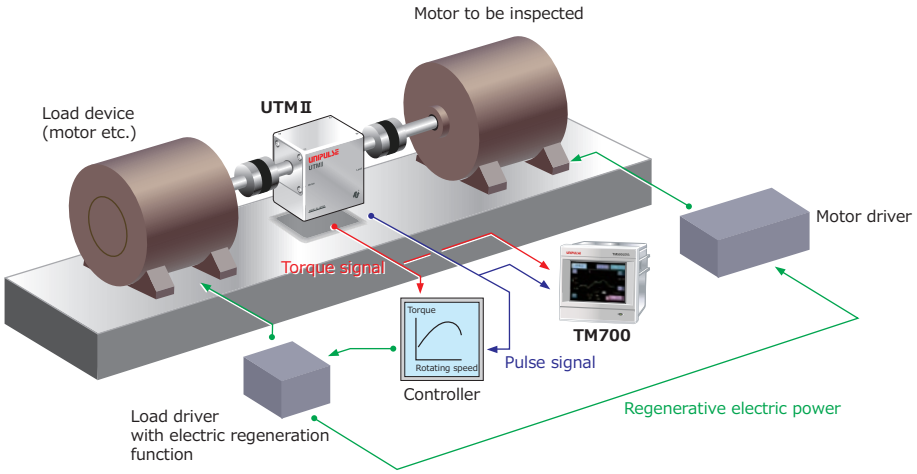
Measurement of dynamic/running torque

Servo-motor with torque output



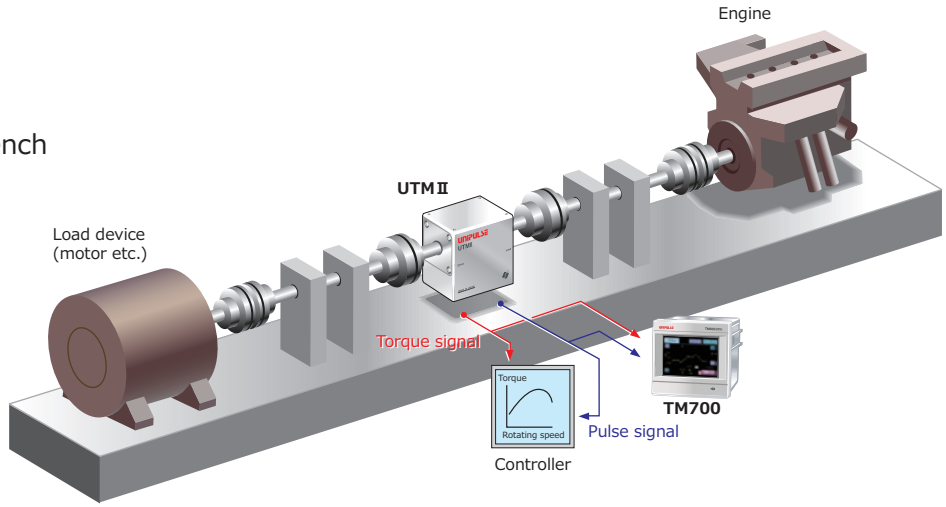
By setting UTMⅡ between the rotary encoder and motor, you can make a servo motor system with torque output. The system can be applied to various applications, such as robot hands or other systems which can detect load.

Motor test bench



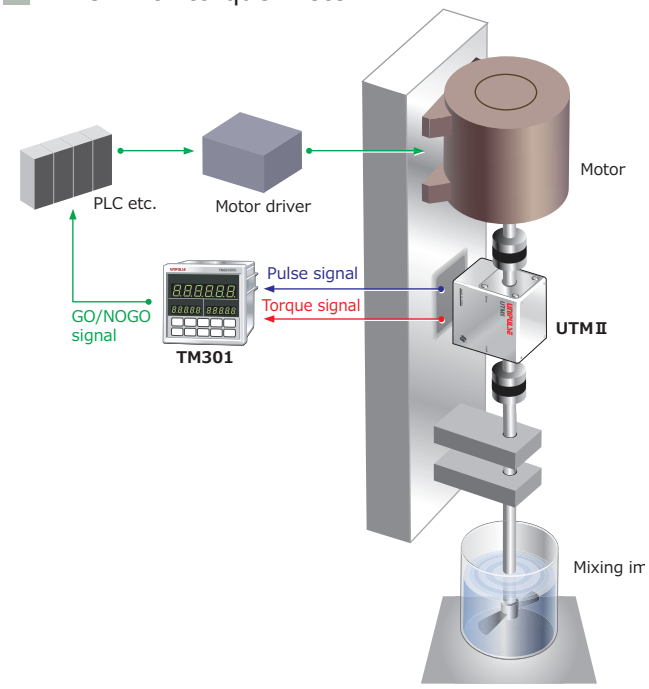
Mechanical power can be calculated from torque and rotating speed.
Also, by applying energy recovery system, the test apparatus will be eco-friendly (energy-saving).

Engine test bench



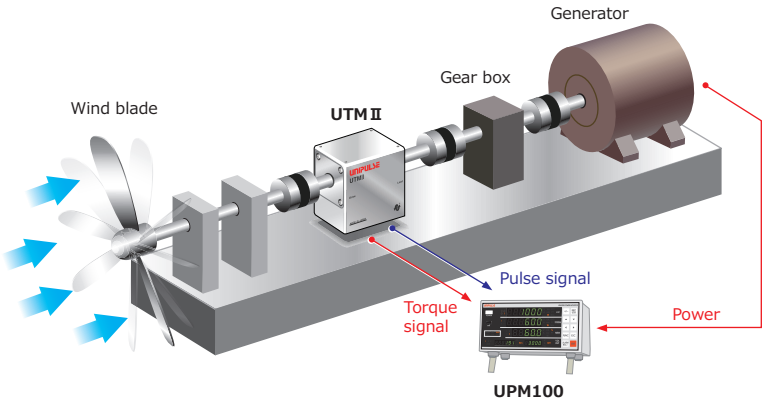
In case of torque measurement with large vibration, such as measurement of engines, please attach double disk coupling and use double bearing.

Mixer with torque meter



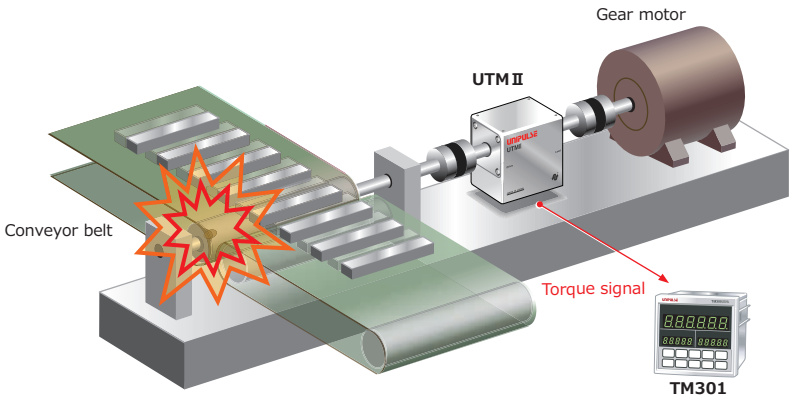
The system measures torque on the axis of mixing impellers. The change of viscosity can be detected by monitoring torque. By using TM301, I/O signals can be controlled by the threshold levels.

Power generation efficiency test



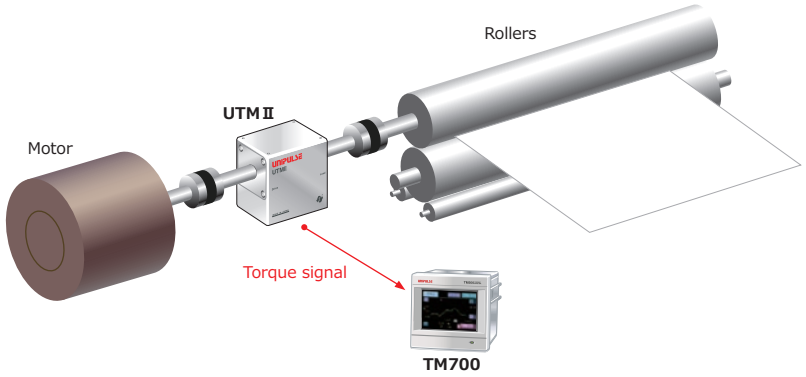
The efficiency of wind turbine generator and so on can be tested. Power can be estimated based on torque and rotational speed measured with UTMⅡ, and power generation efficiency can be calculated by comparing power and generated energy.

Fault detection of conveyor belt



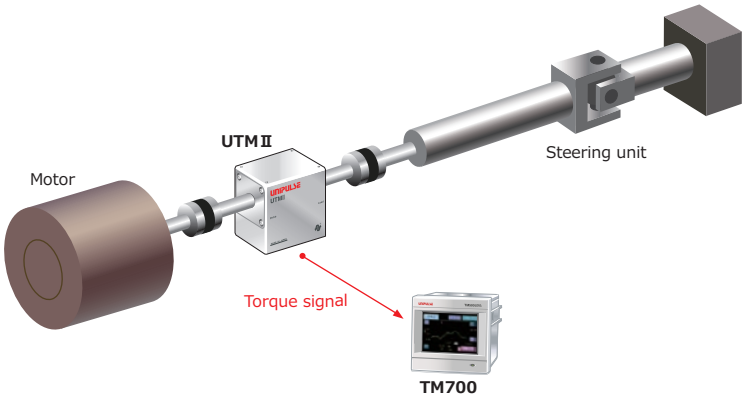
By monitoring the motor shaft torque of a conveyor belt, faults and conveyor-related hazards can be detected (e.g. materials get caught to conveyor system). Conveyor belts will be stopped immediately after faults like contamination and overturning of products are detected.

Measurement of torque required to rotate feed rollers



Torque fluctuation can be monitored while a sheet of paper or film is fed by the drive roller.
With torque measurement, quantitative management and maintenance of feed roller are possible.

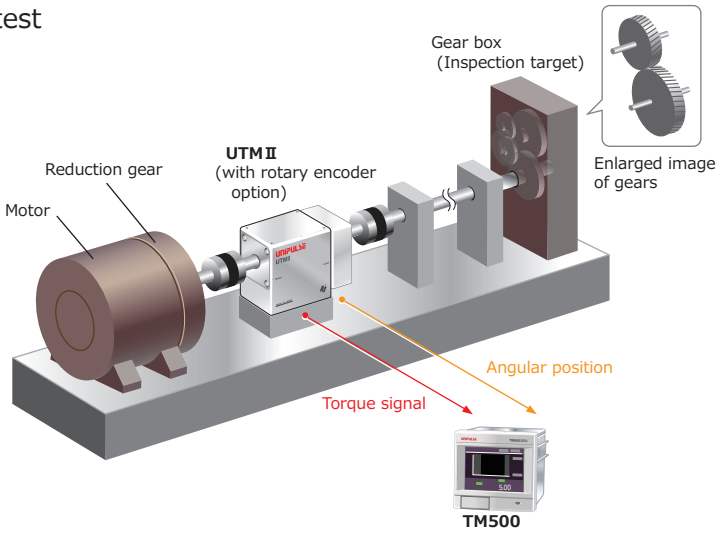
Quality inspection of steering unit



By measuring the torque required to rotate automotive parts such as steering unit, it is possible to quantize the smoothness of the rotation for standardization of the quality inspection.

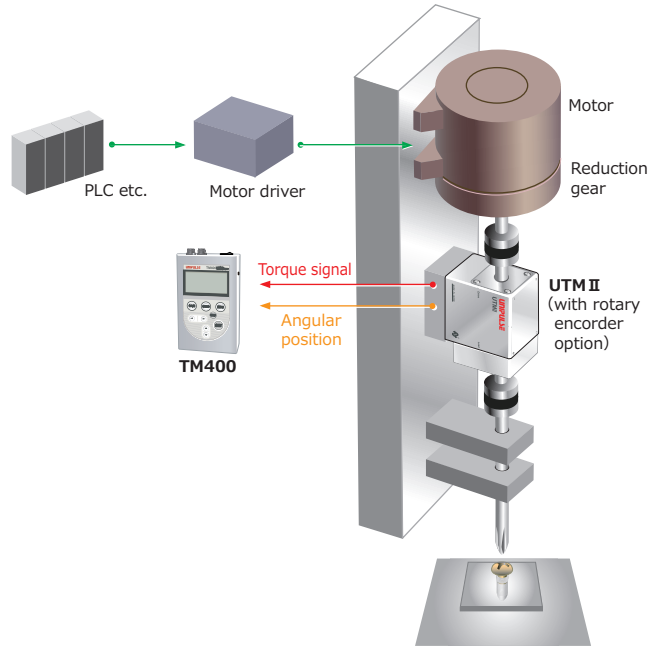
Relationship between torque and angle/displacement (distance)

Physical sensory test



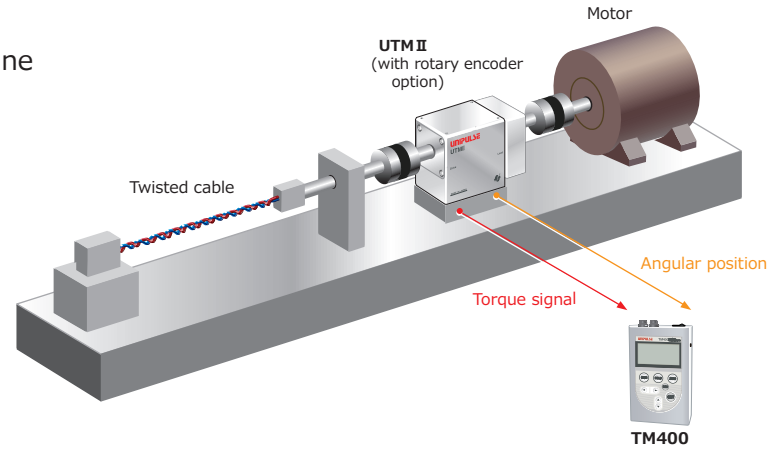
Torque corresponding to angular position can be monitored by using UTMⅡ with rotary encoder option.
The system can be applied to automation of physical sensory test.

Screw driver with torque monitoring



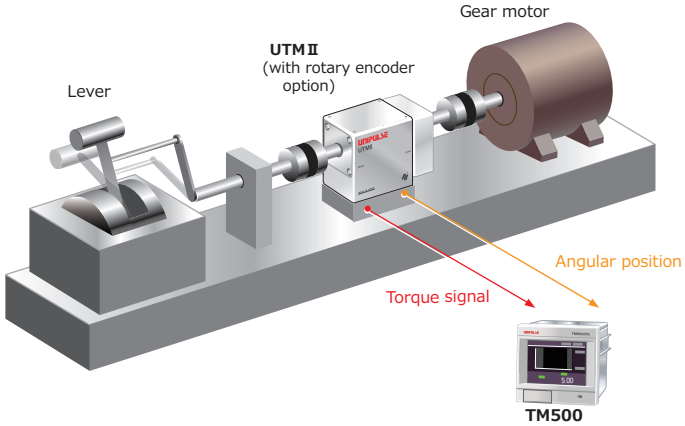
Torque can be measured in the process of tightening screws. Since the torque can be controlled during the whole process, the system can be applied to automation of process.

Torsion testing machine



Stiffness and performance of wire or cable can be tested by checking torque applied by a torsion test machine with UTMⅡ .

Sensory evaluation of lever or hinge



Smoothness of lever, hinge, and so on can be quantized for quality control purpose.
With a optional rotary encoder, torque-angle relationship can be monitored.

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